C2150-6
11/25/87

CHILTON'S

NOVEMBER 1987

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

NEW FOOD PLANT CONSTRUCTION

FOOD ENGINEERING

NEW
FOOD
PLANT
CONSTR.

COVER STORY

Who's building what, and where? Food plant construction and expansion roll on at an accelerated pace for the third year in a row, according to *Food Engineering's* annual survey.

Pages 75 to 93

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) November 1987, Vol. 59, No. 11. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co. is a division of American Broadcasting Companies, Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

13 Industry Report
This month's Report talks about why recycling plastics may be the answer to the problem of diminishing landfills; FDA's Richard Ronk's statement that the responsibility for food safety lies with the processor; how microwave ovens are being used more frequently for cooking frozen vegetables and entrees, not just for reheating leftovers; and the USDA's new policy memo defining the terms "new," "now," "improved," and similar declarations, and how they can be used on approved labeling.

Departments

7 Editorial
10 Calendar
13 Industry Report
27 Marketplace
39 Packaging
126 New In Print
141 People

OLD CHICAGO
SELTZER PLUS

CARBONATED SOFT DRINK: PAGE 27

Engineered Foods

49 Sucrose Polyester
While sucrose polyester is not used for weight control in Japan, it has been used there in other capacities for about five years.

50 Vanilla Beans
Research aimed at utilizing tissue culture technology to produce natural vanilla is encouraging.

60 Stabilizers
Gums and other stabilizers adjust mouthfeel of foods where carbohydrates or fats have been reduced for lower caloric content.

68 Toasted Grains
Cereals and snack foods produced with twin screw extruders can now have toasted flavors as in products baked for longer periods.

72 Literature

TOASTED GRAINS: PAGE 68

CHILTON
FOOD
GROUP

Features

75 New Food Plants
Spurred by high industry profits, healthy sales increases, low interest rates, favorable tax incentives, new technology and a plethora of new products, food-plant construction and expansion continues at a furious pace, as shown in *FE*'s tenth annual survey.

95 Expansions and Retrofits
Expanding an existing plant without disrupting production can be more challenging than building a "greenfield" facility.

107 Membrane Filtration
Process filtration no longer means simply a strainer, wire cloth or filter leaves. A new world of filtration techniques has evolved to handle the more demanding jobs of microfiltration, ultrafiltration, and reverse osmosis.

RETROFITS: PAGE 95

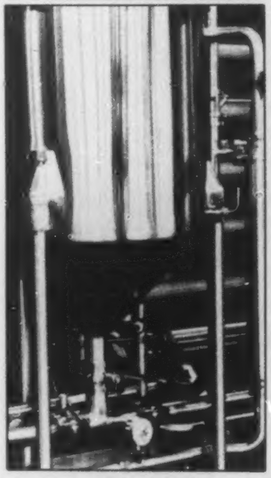
From the Field

113 Graphics terminals link and automate the shop floor.
117 Cost efficiencies realized by extrusion automation.
120 Compact vacuum system boosts capacity of viscous products.
122 Anti-bacterial lubricant good insurance for salad manufacturer.
123 Flour sifters provide company with trouble-free operation.
124 Filtration increases capacity of whey processing plant.

New Equipment

129 Processing Equipment
134 Packaging Equipment
138 Instruments/QC

GRAPHICS TERMINALS: PAGE 113



Special Emphasis

MEMBRANE FILTRATION

Choosing the right filtering equipment can be one of the most important decisions made by a food processor.

Pages 107 to 110

(Continued from page 15)

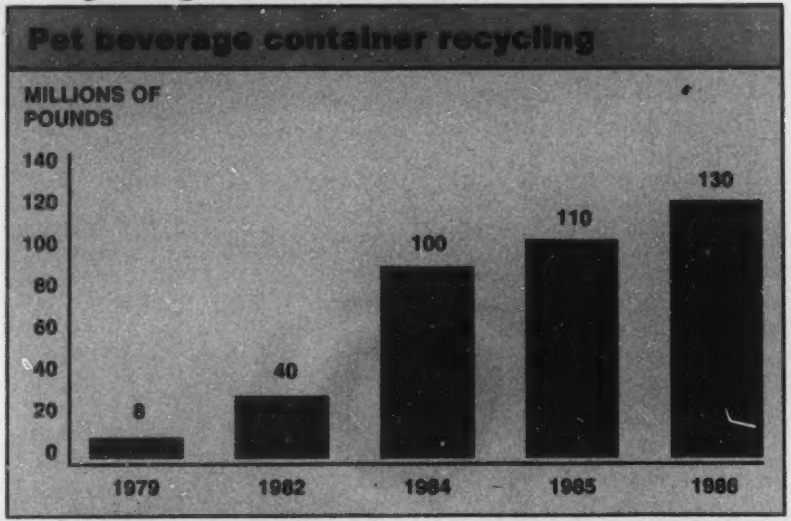
needed to provide complete flexible manufacturing systems. Information from the program should assist food processors in selecting and implementing automation technologies appropriate to their business.

According to Battelle, a number of U.S. and European companies have already joined the program, which is still open for membership at a cost of $20,000 per company. For additional information on the program, contact Dr. Robert Cobb, Battelle, 505 King Avenue, Columbus, Ohio 43201-2693, (614) 424-3266.

Correction

In our September, 1987 story, *Surimi Products Plant Starts-Up in Minnesota,* the manufacturer of the spiral-belt freezers installed at SeaFest Products was misidentified. The systems were manufactured by Northfield Freezing Systems, Inc., Northfield, MN. *Food Engineering* regrets the error.

Recycling: an alternative to landfills



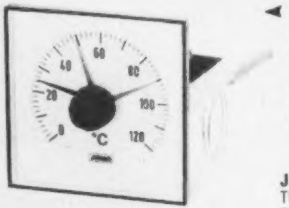
As available landfill acreage declines, recycling will become ever more prevalent in local municipalities which must deal with the growing mass of plastic refuse.

At the recent PET/PE Reclamation Processing Technology Seminar held at Rutgers University September 30, more than 300 representatives of government, industry and education

(Continued on page 21)

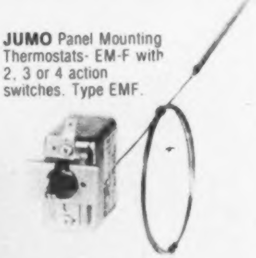
JUMO MEASUREMENT® AND CONTROL

"Quality in Instrumentation equals Reliability in your Equipment"



JUMO Microstat- Electro-mechanical Temperature Controller with process indication with liquid or gas filled measuring system. Type 8501-25-72. UL, CSA and VDE approved.

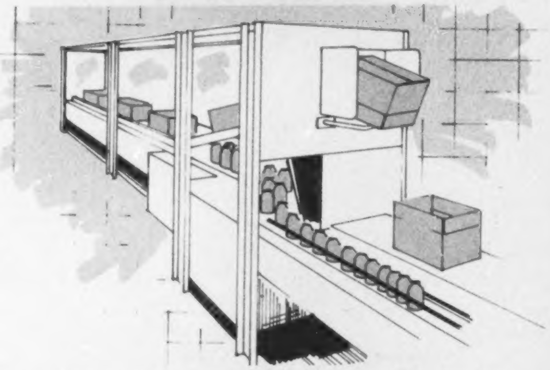
JUMO Panel Mounting Thermostats- EM-F with 2, 3 or 4 action switches. Type EMF.



JUMO Lan T Modular Controller- ¼ DIN on/off-for RTD, thermocouple or current. Depth only 1.9 inch. Type TR01-96/!a.

JUMO PROCESS CONTROL, INC.
410 Garibaldi Avenue, Lodi, N.J. 07644
(201) 779-7744, Telex: 642-406

UNLOAD BOTTLES ...FAST!



Unload automatically with the FB bottle unloader. Just feed reshipper cases to the FB . . . bottles are unloaded, single filed, and the case is uprighted for repacking . . . automatically! Start saving today!

CALL A-B-C 1-800-237-5975
(In Florida, 813/937-5144)

A B C

A-B-C UNLOADERS
A-B-C Packaging Machine Corp., 811 Live Oak St., Tarpon Springs, FL 33589

(Continued from page 19)

met to tackle the ever-growing problem of what to do with the billions of pounds of rigid plastics discarded by consumers each year in the U.S. As landfills close to municipalities and new sites become increasingly more difficult to find, the problem has become more pressing.

The seminar was sponsored by the Plastics Recycling Foundation, the New Jersey Commission on Science and Technology and the Center for Plastics Recycling at Rutgers.

The Center operates its own PET beverage bottle reclamation pilot plant. The plant is currently operating in a sustained test mode at its targeted feed rate of 600 pounds per hour of PET beverage bottles.

Figures cited at the seminar point to a projected production of 55 billion pounds of plastic materials in 1988. Most of this will end up being dumped into landfills unless a better method of handling the solid waste can be found. Since plastics are a non-renewable resource, recycling would appear to be a better method of dealing with the refuse than incineration.

The recycling of PET from post-consumer soft drink bottles is seen as a new engineering polymer source. The Center predicts an availability of 700-800 pounds of soft drink bottles (80 percent of which are PET) available for recycling. The recycling goal is 525 million pounds a year. Currently only about 125 million pounds is being handled in this manner, so using an anticipated price of 30-35 cents/pound for the recycled PET, this is an area of projected growth and profit potential.

Market analysis

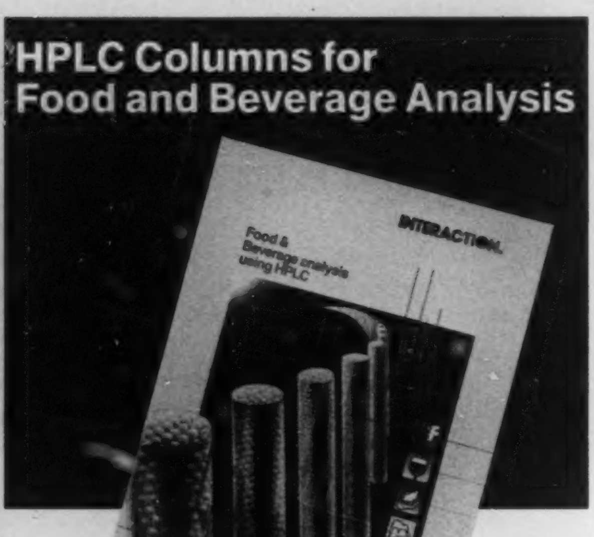
Robert A. Bennett of the College of Engineering at the University of Toledo, OH, presented his findings: "Market Analysis on Recycled Plastics."

Bennett's research was aimed at pinpointing and understanding the markets for recycled plastics as well as identifying potential products which would be derived from the recycled materials. It is Bennett's feeling that "market demand for recycled plastics will be a long term factor that will help drive plastics recycling and assure that post-consumer resin scrap has an economic value as possessed by competing materials such as glass and metal."

For those entrepreneurs becoming involved in recycling, the supply of plastics will be virtually unlimited, says Bennett. His presentation forecast that by the end of 1987 more than 50 billion pounds of plastics will be consumed in the U.S., excluding textile applications. In 1986 the figure cited as 49 billion pounds, of which the largest component was polyethylene (high density and low density) which accounted for 32 percent of last year's sales in the U.S. This was followed by polypropylene at 6 billion pounds and polyvinyl chloride at 5.8 billion pounds.

Polyester (thermoplastic and unsaturated) accounted for 2.9 billion pounds, or 6 percent, of last year's

(Continued on page 23)



HPLC Columns for Food and Beverage Analysis

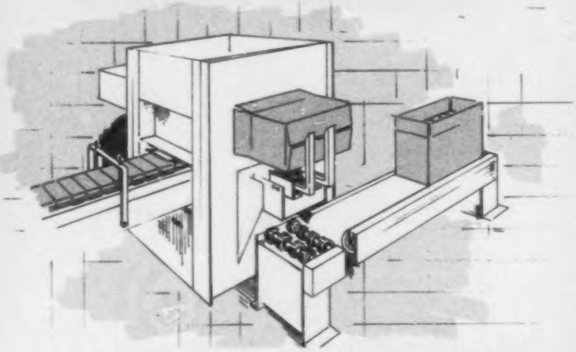
- New 20 page catalog describes a complete line of HPLC columns specifically developed for applications in food and beverage analysis. Determine carboxylic acids, aromatic acids, amino acids, monosaccharides, disaccharides, oligosaccharides, sugar alcohols, and inorganic anions and cations in a wide range of food samples. Applications described include wine, beer, fruit drinks, dairy products and drinking water.

Interaction Chemicals Inc., 1615 Plymouth St., Mtn. View, CA 94043 USA 415-969-2400

INTERACTION®

Circle 19 on Inquiry Card

ELIMINATE HAND PACKING!



One person can do the work of two or three hand packers. The Labor-Saver packs automatically . . . the operator just supplies cases. Increase your efficiency today!

CALL A-B-C 1-800-237-5975
(In Florida, 813/937-5144)

A-B-C CASE PACKERS
— A-B-C Packaging Machine Corp., 811 Live Oak St., Tarpon Springs, FL 33589

Circle 20 or see FEM, p. 2

(Continued from page 21)

sales in the U.S. Because of thermoplastic's ability to be remelted or extruded into remanufactured products, it is ideal for recycling. Bennett estimates that more than 130 million pounds of polyester, commonly called "PET," beverage containers are being recycled currently in the U.S.

Where are the markets?

Bennett's research has identified several end-use markets for recycled plastics, including fiberfill, currently the primary market for recycled postconsumer PET. Recycled PET is also being used in autobody putty, cultured marble, wood substitution (unsaturated polyester), for various engineering applications, for strapping and as polyurethane foam in building insulation.

Polyethylene when recycled has many uses, including base cups for beverage containers, flower pots, plastic lumber for outdoor furniture, boat docks, toys, pails, pipes and drums.

Mixed plastics, from plastic scrap of many different types, can be used to manufacture railroad ties and for lumber substitutes for outdoor furniture, posts and farm structures, and car stoppers for parking lots.

History of plastics recycling

The U.S. is well acquainted, and becoming more involved, with recycling. Aluminum containers have long been recycled, as have glass containers. When the PET beverage container was introduced in the U.S. in 1978, recycling began almost immediately, due to the efforts of small entrepreneur recyclers. In 1979, eight million pounds of bottles were recycled. By 1982, 40 million pounds was being recycled; by 1985 110 million pounds of bottles were handled. Bennett's research pointed to an estimated figure for 1986 of 130 million pounds.

Although much more process technology and market research needs to be done before plastics recycling can become an economically viable business, the seminar was proof that steps are being taken in the right direction. Recycling is not something we can afford to ignore, it is rapidly become the reality of the day.

(This report on plastics recycling was written by Linda K. Freeman, Contributing Editor.)

Targeted Export Assistance announced

USDA has slated 34 projects to receive $80 million in Targeted Export Assistance (TEA) allocations for fiscal year 1988. The TEA program, authorized by the Food Security Act of 1985, uses surplus stocks from the Commodity Credit Corporation to help U.S. producers finance promotional activities for U.S. agricultural products to counter or offset adverse effects of unfair foreign trade practices.

1988 promotion efforts will cover a wide range of U.S. agricultural commodities including wheat, meat, poultry, seafood and other high-value products. For additional information, call (202) 447-5521.

WE DESIGN, BUILD, REFRIGERATE & SERVICE

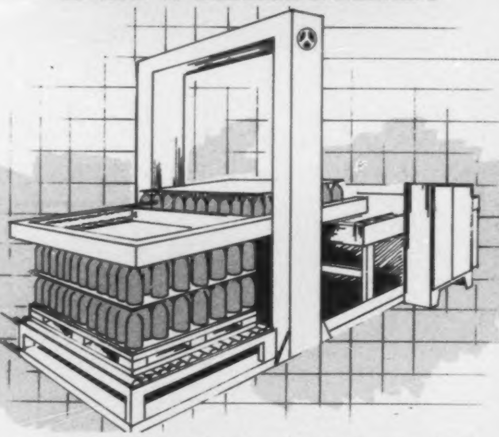
Concept To Completion

Total turnkey service — from site feasibility to occupancy. We guarantee on time completion with Stellar quality, all within budget.

So before you start your next project, call Ron Foster to add The Stellar Group to your team.

THE STELLAR GROUP
7970 Baybery Road, Suite One
Jacksonville, Florida 32216
(904) 636-9966

DEPALLETIZE!



You'll have less labor, use less floor space, have less downtime when you unload your bulk bottles with the sweep-off bulk depalletizer from A-B-C! Call us today!

CALL A-B-C 1-800-237-5975
(In Florida, 813/937-5144)

A-B-C DEPALLETIZERS
A-B-C Packaging Machine Corp., 811 Live Oak St., Tarpon Springs, FL 33589

10th Annual New Plants Survey

Who's building what, and where? Food plant construction and expansion roll on at an accelerated pace for the third consecutive year.

New 120,000 sq.-ft. plant operated by Meadowland Creamery, a division of the Kroger Co., started producing fluid milk and orange juice in July, 1987, at Conroe, TX. (Photo: Hixson Architects-Engineers)

Food Engineering's 10th annual New Plants Survey—compiled from studies conducted by Conway Data, Inc. (Norcross, GA) and *Food Engineering*—reveals a record 339 projects planned, under construction or started up during the past year, up from the 332 projects recorded last year and continuing the construction boom first reported in 1985, when new plant construction/expansion projects surged to 295 from the 201 listed in 1984. The trend, in fact, has been steadily up since 1983, after plateauing in the early '80s.

Part of this boom may be due to improved reporting techniques, but a 60-percent surge in food-plant construction over three years is no fluke: It confirms *Food Engineering*'s "State Of The Industry" reports over the past three years indicating a flourishing industry operating in a healthy economy. "Unit sales increases are needed to build new plants—you can't pay for a new plant with labor savings," notes an engineer from a major A/E firm.

This year's new-plant survey generally confirms industry trends but again contains a surprise or two. One surprise is the number of new plants: 198 of the 339 plants listed—or 58 percent of the total—are new construction as opposed to expansions/renovations. In our 1985 and 1986 studies, the ratio of new plants to expansions/renovations was about 50/50. Another mild surprise is the number of freestanding distribution centers (i.e., not part of a manufacturing-plant project). This year, 35 of the 339 projects listed—nearly 10 percent—are warehouse/distribution centers, mostly for frozen and refrigerated products. This seems to confirm the "natural" and convenience-food trends, and the shift away from canned foods to fresh and frozen. The low-calorie/low-cholesterol trend is again apparent in the number of poultry plants: No less than 41—or 12 percent of the total—are poultry plants, on top of the 23 reported in 1986 and 21 in 1985.

New technology is apparent in the new General Foods aseptic-products plant at Mason City, IA; the Westco Drying plant at Desert Hot Springs, CA (acoustic drying); the American Maize cyclodextrin plant at Hammond, IN; the Nutri-Cheese analog cheese plant at Oak Park, IL; the New Tech Snacks pasta-snack plant at Joliet, IL; Wornick's microwave-entree at New Braunfels, TX; The Great Lakes Chemical plant at Newport, KY, which will make an unspecified intense sweetner; The SeaFest Products surimi-products plant at Motley, MN (*FE*, Sept., '87).

The current building boom may cool, however, as interest rates move up. As of October 16, the prime rate stood as high as 9¾ percent, up 2¼ from a year earlier, and further hikes may be in store after the mid-October stock market crash.

(Continued on next page)

CHARLES E. MORRIS
Midwest Editor

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
			A				
Adolph Coors	Elkton, VA	Beer pkg., dist.	–	New	95	250	–
Advanced Foods USA	Iowa Falls, IA	–	40	New	–	23	–
Ag Processing	St. Joseph, MO	Edible oil	–	Exp.	3	–	Process Systems, Inc.
Albertson's	Gresham, OR	Groc. dist.	541	New	25.5	–	A. Epstein & Sons
Amalia Food Products	Columbia, SC	–	20	New	–	40	–
American Fructose	Decatur, AL	HFCS	–	Exp.	20	–	–
American-Italian Pasta	Excelsior Spgs., MO	Pasta	150	New	26	65	–
American Maize	Hammond, IN	Cyclodextrins	–	New	–	–	–
American Popcorn	Sioux City, IA	Popcorn	–	Exp.	–	–	Davy McKee
American Soy Products	Saline, MI	Soy milk	–	New	2.9	35	–
A&M Farms	Sandusky, OH	–	91	New	0.6	–	–
Anheuser-Busch	Los Angeles, CA	Beer	–	Renov., exp.	–	–	MK-Ferguson
Anheuser-Busch	Ft. Collins, CO	Beer	1300	New	300	–	MK-Ferguson
Anheuser-Busch	Tampa, FL	Beer	47	Exp.	45	49	Lockwood Greene
Anheuser-Busch	St. Louis, MO	Beer	–	Exp.	–	–	MK-Ferguson
Anheuser-Busch	Newark, NJ	Beer	150	Exp.	150	–	MK-Ferguson, Sverdrup
Anheuser-Busch	Columbus, OH	Beer		Renov.		–	MK-Ferguson
Anheuser-Busch	Memphis, TN	Bakers yeast	–	New	–	–	–
A. Reich & Sons	Kansas City, MO	Food dist.	139	New	8	135	Fernstrom & Assoc./Summit Bldgs.
Arkansas City Packing	Arkansas City, KS	–	8	Exp.	–	300	–
A. Smith Bowman Distillery	Spotsylvania, VA	Whiskey, vodka	–	New	–	50	–
Atlantic Food Services	Prince Wm., VA	Proc. foods	–	Exp.	10	250	–
Austin Foods	Cary, NC	Snack foods	250	New	30	100	–
			B				
Bahlsen of America	Cary, NC	Cookies, crackers	250	Exp.	30	–	–
Balanced Energy	Clinton, IA	Fat pellets (feed)	22	New	5	45	–
Barbara's Bakery	Somoma Cty, CA	Baked goods	–	Exp.	–	–	–
Beatrice Grocery	Sylvester, GA	Peanut butter	–	New	–	100	–
Beatrice Cheese	Elm Grove, WI	Cheese	–	New	–	300	–
Beaver Street Foods	Jacksonville, FL	Frz. meat & seafood	62	Exp.	2.5	–	The Stellar Group
Beckman Produce	Beloit, WI	Proc. foods	25	New	1	20	–
Beef Specialists Iowa	Hartley, IA	Proc. beef	20	Exp.	1.8	103	–
Bel Cheese	Lawrenceburg, KY	Cheese	–	Exp.	1	30	–
Bell Brands	Santa Fe Spgs., CA	Corn, potato chips	166	New	13.6	–	Austin Co.
Ben & Jerry's Ice Cream	Waterbury, VT	Ice cream	15	Exp.	–	30	St. Onge, Ruff Assoc.
Best Foods	Asheboro, NC	–	–	New	–	–	Fluor Daniel
Best Foods	Bayonne, NJ	Mayo., veg. oil	160	New	80	160	Lockwood Greene
Besnier America	Turlock, CA	Brie cheese	–	New	2	50	L&A Eng. & Equip.
Bicara Ltd.	Los Angeles, CA	Meat products	–	Exp.	–	–	–

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Biggers Bros.	Alcoa, TN	Dry groc. dist.	195	New	12	120	Food Plant Eng.
B.K. Foods	Gadsden, AL	Proc. chicken	20	New	2.5	100	–
Borden	Orlando, FL	Milk, dairy products	12	Exp.	1.5	–	The Stellar Group
Borden/Superior Dairy	Austin, TX	Fluid milk	50	New	–	–	Hixson, Fluor Daniel
Boxford Poultry	Fresno, CA	Poultry	–	Exp.	–	–	–
Brookshire Grocery	Tyler, TX	Dist. ctr.	255	Exp.	6.5	–	–
Brown Packaging	South Holland, IL	Food pkg.	15	Exp.	1	15	–
Burris Refrig. Services	Lyndhurst, VA	Frozen food, dry dist.	102	New	–	–	The Stellar Group
Burris Refrig. Services	Waynesboro, VA	Frozen food dist.	104	Exp.	4	–	The Stellar Group
Byerly's	Lake Mills, IA	Soup	–	New	1.3	60	–
Byrne Dairy	DeWitt, NY	Milk, dairy prod.	–	Exp.	4	17	–
C							
Cagle Co.	Collinsville, AL	Poultry	–	Exp.	1.2	230	–
Cain's Coffee	Oklahoma City, OK	Coffee, tea	–	New	2	–	–
Cal-Ida	Gooding, ID	Potato proc.	80	New	–	300	–
California Prison Ind.	Ione, CA	Meat products	35	New	5	–	Richardson-Voinovich/ A. Epstein
Calva Products	San Joaquin, CA	Feed	–	Exp.	–	–	–
Campbell Soup	Maxton, NC	Soup	–	Exp.	20	–	–
Capri Sun	Fresno, CA	Juice drinks	–	Exp.	–	–	–
Cargill	Memphis, TN	Corn oil	–	Exp.	10	12	Process Systems, Inc.
Cargill	Memphis, TN	HFCS	–	Exp.	–	–	–
Carlin Foods	Gardena, CA	Fruit fillings	27	New	1.7	–	A. Epstein & Sons
Carling Nat. Breweries	Frankenmuth, MI	Beer	–	New	7	60	–
Carnation Co.	Bakersfield, CA	Ice Cream	210	New	53	250	A. Epstein & Sons
Carolina Turkeys	Mt. Olive, NC	Turkey	217	New	38	900	HSD, Inc.
Central Soya	Gibson City, IL	Soy proteins	–	Exp.	–	–	–
Central Soya	Remington, IN	Soy proteins	–	Exp.	–	–	–
Central Valley Dairy	Tulare, CA	Cheese	172	New	20	125	–
Chateau Grand Traverse	Traverse City, MI	Wine, brandy	–	New	1	–	–
Cherry Hill Processors	Bailey, MI	Fruit juices	–	New	1.3	139	–
Chico-San	Gridley, CA	Rice cakes	55	New	–	–	–
Chico-San	Metcalfe, MS	Rice cakes	–	Exp.	1.8	50	–
Chiquita Tropical Prod.	Ft. Pierce, FL	Citrus packing	–	New	–	100	–
Chowchilla Nut Pkg.	Madera Cty. CA	Nuts	–	Exp.	–	–	–
Church & Dwight	Tiffin, OH	Dairy products	365	New	3.5	15	–
Coca-Cola Bottling	Benecia, CA	Coca-Cola	80	New	–	130	–
Coca-Cola Bottling	Belmont, NH	Coca-Cola	45	Exp.	–	–	–
Columbia Farms	Columbia, SC	Broilers	15	New	–	–	HSD, Inc.
ConAgra Poultry	Falkville, AL	Poultry products	36	New	4	30	–
ConAgra Poultry	Carthage, MO	Poultry products	23	Exp.	9	100	St. Onge, Ruff Assoc.
ConAgra Poultry	Carthage, MO	Poultry products	8	Exp.	–	–	St. Onge, Ruff Assoc.
ConAgra Poultry	Chatanooga, TN	Poultry products	30	Exp.	1.3	128	–

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Contadina Foods	Hanford, CA	Canned tomatoes dist.	120	Exp.	1.2	–	– –
Continental Flavors	Bridgeport, NJ	Flavors	–	New	–	–	–
Continental Smelkinson	Jessup, MD	Food service dist.	240	New	12	250	–
Cornland Beef Proc.	Lexington, NE	Cattle proc.	–	Exp.	0.7	105	–
Country Maid	Milwaukee, WI	Salads	34	New	1.3	59	–
Country Skillet Poultry	Dalton, GA	Poultry	–	Exp.	–	100	–
CPC International	Stockton, CA	Corn wet milling	–	Renov., exp.	–	–	–
CPC International	Argo, IL	Corn wet milling	–	Renov., exp.	–	–	Fluor Daniel
CPC International	Asheboro, NC	Dehy. soups, sauces	140	New	12	100	–
Cremosa Cheese	Ocala, FL	Dairy dist.	30	New	2	15	–
Crosset Co.	Saline, MI	Fruit, veg. proc.	–	New	3.1	135	–
C&S Wholesale Grocers	Brattleboro, VT	Frozen food dist.	100	New	6	60	St. Onge, Ruff Assoc.
Cuba Cheese	Cuba, NY	Cheese products	62	Exp.	13	30	–
Cuddy Farms	Marshville, NC	Turkeys	–	New	6.5	–	–
Cuddy Food Products	London, ON	Turkey proc.	150	New	14	290	–
D							
Ded's Cookie Co.	Plant City, FL	Bakery products	–	New	4.5	150	–
Daily, Inc.	Missoula, MT	Bacon	8	New	1.2	–	Austin Co.
Dairymen, Inc.	Greensboro, NC	Milk, dairy prod.	–	Exp.	–	–	Hixson
Dairymen, Inc.	Wilkesboro, NC	Milk, dairy prod.	–	Exp.	–	–	Hixson

ALLEN DISTRIBUTION SYSTEMS

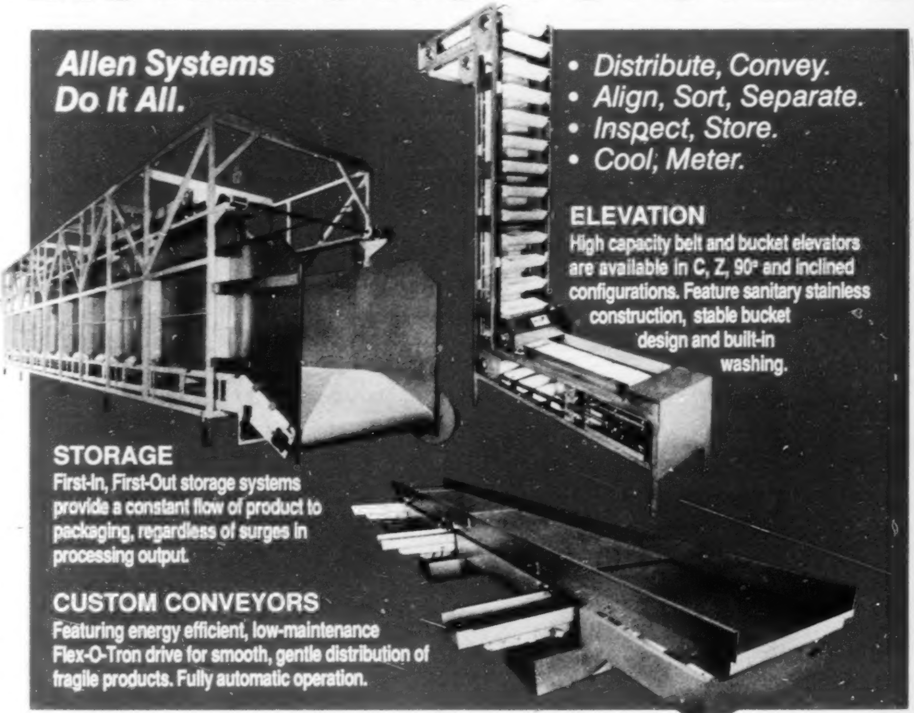
Custom Systems Built With Quality And Innovative Engineering.

At Allen Machinery, innovative engineering, 40 years of experience, the best materials and superb workmanship go into each system we build.

In thousands of food processing installations around the world, Allen systems are continually proving that quality invested during design and manufacturing, pays off in reliability and economy on the job. In fact, Allen's distribution systems feed more vertical packaging machines than any other.

ALLEN MACHINERY

PO Box 469
Newberg, OR 97132
Phone: 503 538-3141
FAX: 503 538-8575



Allen Systems Do It All.

- *Distribute, Convey.*
- *Align, Sort, Separate.*
- *Inspect, Store.*
- *Cool, Meter.*

ELEVATION
High capacity belt and bucket elevators are available in C, Z, 90° and inclined configurations. Feature sanitary stainless construction, stable bucket design and built-in washing.

STORAGE
First-In, First-Out storage systems provide a constant flow of product to packaging, regardless of surges in processing output.

CUSTOM CONVEYORS
Featuring energy efficient, low-maintenance Flex-O-Tron drive for smooth, gentle distribution of fragile products. Fully automatic operation.

When experience counts, come to Allen.

Circle 56 or see FEM, p. 26

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Dairymen, Inc.	Roanoke, VA	Milk, dairy prod.	–	Exp.	–	–	Hixson
David Michael & Co.	Philadelphia, PA	Flavors, stabilizers	15	Exp.	–	–	–
Dean Foods	Eaton Rapids, MI	Pickles	–	New	1.2	20	–
Dean/Reiter	Springfield, OH	Ice cream	15	New	–	–	Hixson
Del Grossi Food	Eugene, OR	Italian cheese	–	New	–	51	–
Delta Catfish	Belzoni, MS	Frozen catfish	–	New	3	100	–
Delta Oil Mill	Jonestown, MS	Cottonseed oil	–	Exp.	2	10	–
DeRosa Pasta	Fremont, NE	No-boil pasta	30	New	–	70	–
Dial Corp.	Montgomery, IL	Fats & oils	–	Exp.	2	–	Austin Co.
Distron Div., Burger King	Greensboro, NC	Burger King dist.	10	Exp.	1	–	The Stellar Group
Dona Ana Spec. Flour	Rincon, NM	Flour	10	New	2.5	20	–
Dot Foods	Mt. Sterling, IL	Dry, refrig. distributor	116	New	–	–	Nixon Assoc., Star Bldg. Systems
Douglas Enterprises	Miami, FL	Cold storage, dist.	65	New	0.8	10	–
Dubuque Packing	Norfolk, NE	Beef processing	120	New	10.4	400	–
Duche Nut	Chico, CA	Nuts	–	Exp.	–	–	–
Duval Beverage Dist.	Jacksonville, FL	Beer distributor	75	New	3	–	The Stellar Group
E							
East Asiatic Co.	Booneville, MS	Proc. meats	–	Exp.	7.5	100	–
Emerland Storage	Cordele, GA	Nut storage	200	New	6	150	–

THE D&Z COMMITMENT...

"TO BE THE BEST - OUR CLIENTS DESERVE THE BEST."

Engineering, Architectural and Construction Services for:

Feasibility Studies
Site Selection
R&D / Pilot Facilities
Food & Beverage Processing

Our Technical Expertise Includes:

CIP Systems
Sanitary Design
Automation & Robotics
Packaging & Ingredient Handling
GMP, FDA Compliance

DAY & ZIMMERMANN, INC

...DEDICATED TO — EXCELLENCE

Circle 57 on Inquiry Card

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employees	Architects/ Engineers
Ermark	Harrisburg, PA	Liquor-fld. candy	–	New	10	100	–
Excel Corp.	Rock Port, MO	Beef packing	–	New	–	100	–
F							
Fasco Mills	Mendota, IL	–	–	New	–	–	–
Fiorucci Foods USA	Chesterfield, VA	Meat processing	–	New	–	100	–
Fisher Mills	Portland, OR	Flour products	55	New	2.3	7	–
Flavor House Products	Dothan, AL	Nuts, bakery ingrd.	148	New	6.5	148	–
Freeze Point	Haines City, FL	Frozen storage	49	New	1.8	–	A. Epstein & Sons
Freeze Point	Manteno, IL	Frozen storage	100	New	5	–	A. Epstein & Sons
French American Bakery	Hayward, CA	Croissants, cookies	14	New	–	–	Finger & Moy
Fries & Fries	Cincinnati, OH	Flavor R&D	50	New	7	–	Hixson
Frito-Lay	Kern Cty, CA	Snack foods	162	New	–	400	Kaiser Engineers
Frito-Lay	Perry, GA	Snack foods	–	New	–	–	Fluor Daniel
Frito-Lay	Pulaski, TN	Snack foods	–	Exp.	–	–	Hixson
G							
Gallo Vineyards	Portland, OR	Wine dist.	40	New	2.3	50	–
Garden Fresh Foods	Milwaukee, WI	Veg. proc.	100	New	0.8	88	–
General Foods	Duval Cty, FL	Roasted coffee	105	New	2	25	–
General Foods	Mason City, IA	Desserts	160	Renov.	–	–	–
General Mills	Covington, GA	Breakfast cereal	200	New	100	110	–
General Mills	San Joaquin Cty, CA	–	–	Exp.	–	–	–
George's Co.	Butterfield, MO	Poultry proc.	87	New	10	400	–
George's Co.	Cassville, MO	Poultry proc.	87	New	10	400	–
Georgia Feed Proc.	Sylvester, GA	Feed ingredients	–	New	–	50	–
Gilster Co.	Perryville, MO	Cereal products	56	Exp.	–	130	–
Gilster-Mary Lee	Perryville, MO	Cake mix, cereal	30	Exp.	2	–	–
Gold Bond Ice Cream	Ocala, FL	Ice cream novel.	50	Exp.	7	100	–
Gold Bond Ice Cream	Henderson, NY	Ice cream novel.	100	New	–	300	–
Golden Cheese California	Corona, CA	Cheese packaging	1	Exp.	3	10	Pettit Int'l
Golden Cheese California	Corona, CA	Wastewater evap.	7	Exp.	6	–	Pettit Int'l
Golden Cheese California	Corona, CA	Cogeneration	45	Exp.	50	2	Power Systems
Golden State Foods	City Industry, CA	Fresh salads	166	New	5	–	Austin Co.
Gold Kist-Golden Poul.	Sanford, NC	Chicken proc.	65	New	10	325	–
Goldsboro Milling	Goldsboro, NC	Feed mill	–	New	2	–	–
Great Bend Packing	Great Bend, KS	Bacon, boneless ham	25	Exp.	–	100	– –
Great Lakes Chemical	Newport, TN	Intense sweetener	–	New	30	100	Process Systems, Inc.
Green Foods	Oxnard, CA	Proc. foods	80	New	8.5	50	–
Griffin Pie	London, KY	Pies	–	Exp.	3.4	35	–
GSE Agri-Products	Baton Rouge, LA	Gluten, alcohol	–	New	60	60	Process Systems, Inc.
H							
Haagen-Dazs	Tulare, CA	Ice cream	30	Exp.	1.9	–	–

NEW FOOD PLANTS

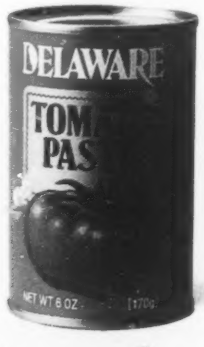
Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Hannaford Bros.	S. Portland, ME	Frzn. food dist.	60	New	4	–	St. Onge, Ruff Assoc.
Harker's	Sioux Center, IA	Sausage, frzn. veg.	18	Exp.	3	75	–
Helix Int'l./Dews Labs	Baton Rouge, LA	Rice products	–	New	1	10	–
Hernando Egg Prod.	Brooksville, FL	Eggs	20	New	1	50	–
Heublein Wines	Madera Cty, CA	Wine	–	Exp.	–	–	–
Hills Bros. Coffee	Suffolk, VA	Coffee	33	New	1	50	–
Hills Pet Products	Bowling Green, KY	Prescription pet foods	100	Exp.	12	–	Sverdrup
Holly Farms Poultry	Monroe, NC	Poultry products	–	Exp.	30	400	–
Holly Farms Poultry	Wilkesboro, NC	Roasted chicken	171	New	15	300	–
House of Raeford	Nesmith, SC	Poultry	–	New	–	200	–
I							
IBP	Council Bluffs, IA	Pork proc.	217	New	8	600	–
IBP	Manchester, IA	Pork proc.	–	New	–	1200	–
IBP	Madison, NE	Pork proc.	–	Exp.	0.2	600	–
Illinois Pork Proc.	Monmouth, IL	Proc. meats	–	New	15.5	700	–
Indi-Bell	Sunflower, MS	Catfish, dog food	–	Exp.	5	6	–
Ind. Cold Storage	Jacksonville, FL	Frozen food refrig. dist.	116	New	5	–	The Stellar Group
Inst. Food House	Florence, SC	Frozen food. perishables	90	New	3	60	St. Onge, Ruff Assoc.
Int'l Seasoning	Harrisonburg, VA	Seas. fm poultry	70	New	10	30	–
Iowa Ham Canning	Oelwein, IA	Proc. hams	–	New	–	50	–
J							
J.M. Smucker	Memphis, TN	Jams, jellies	–	Exp.	5	100	Ellers, Oakley, Chester, Rike L&A Eng. & Equip.
John B. Sanfillipo	Bainbridge, GA	Nuts	–	New	10	200	–
John Morrell	Sioux Falls, SD	Meat packing	–	Exp.	2.1	600	–
K							
K.B. Specialty Foods	Greensburg, IN	Prepared foods	–	Renov.	–	–	Hixson
Keebler	Miramar, FL	Dist. center	37	New	1	–	–
Keebler	Elmhurst, IL	R&D	85	New	5.8	–	A. Epstein & Sons
Keebler	Cincinnati, OH	Baked goods	–	Renov.	–	–	Hixson
Keebler	Haltom City, TX	Snacks	148	New	8.4	–	A. Epstein & Sons
Kellogg	Battle Creek, MI	Cereals	–	Exp.	500	–	Fluor Daniel
Kemp Foods	Duluth, MN	–	–	New	2.1	103	–
Kenlake Foods	Murray, KY	Powdered drinks	–	Exp.	1.5	–	–
Kidd & Co.	Henderson, NV	Marshmallows	120	New	–	60	–
Kikkoman	Walworth, WI	Soy sauce	–	Exp.	4	–	Austin Co.
Klein Seafood	Baton Rouge, LA	Seafood proc.	–	Reloc., Exp.	–	–	Davy McKee
Kraft	N. Lawrence, NY	Dairy products	–	Exp.	–	–	–
Kroger Co.	Cincinnati, OH	Frzn. novelties	–	Renov.	–	–	Hixson
L							
Lamb Weston	Hermiston, OR	Frozen foods	70	Exp.	5.5	70	–
Land O'Lakes	Ellsworth, IA	Proc. turkey	6	Exp.	1	200	–

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Lemig Bros. Bakeries	Vincennes, IN	Bakery products	80	New	3.1	150	–
Lewis Smoked Meats	Chicago, IL	Proc. meats	–	New	–	–	–
Liqui-Dri Foods	Louisville, KY	Biscuit mix, flour	–	Exp.	1	–	–
Louis Rich	Tulsa, OK	Turkey	–	New	–	150	–
Louisiana Crawfish	St. Martinville, LA	Frzn. crawfish	24	New	1.8	–	–
Louisiana Poultry	Winnfield, LA	Poultry	–	New	15	250	–
M							
Maple Leaf Farms	Milford, IN	Ducklings	220	Exp.	36	900	HSD, Inc.
Marshall Durbin	Hattiesburg, MS	Poultry proc.	–	Exp.	2.1	–	–
Martin Brower	Pompano Beach, FL	Dist., McDonald's	60	New	2	–	Stellar Grp.
Masstock Int'l	Macon, GA	Milk	–	New	6	–	–
Mazo Lerch Co.	Alexandria, VA	FF dist.	20	Exp.	–	–	St. Onge, Ruff Assoc.
Mazza Cheese	Sumner, WA	Cheese	65	New	–	100	–
McKee Baking	Gentry, AR	Cakes	–	Exp.	5.5	350	–
McKee Baking	Collegedale, TN	Snack cakes	40	Exp.	2	–	–
McKee Baking	Augusta, Cty., VA	Snack cakes	–	New	–	200	Fluor Daniel
Meadowland Creamery	Conroe, TX	Milk, orange juice	120	New	20	–	Hixson
Merchants Distributors	Hickory, NC	Frzn. food dist.	100	New	4.7	–	St. Onge, Ruff Assoc.
Merico, Inc.	Little Rock, AR	Bread, buns	50	Exp.	15	50	Lockwood-Greene

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Mesa Food Products	Louisville, KY	Mexican chips	–	New	2.5	60	–
Michael G. Davey	Mason City, IA	Desserts	160	New	3.6	–	–
Mid-America Dairymen	Winsted, MN	Whey products	–	New	–	–	–
Mid Valley Dairy	Stanislaus Cty, CA	Dairy products	–	Exp.	–	–	–
Midwest Grain Prod.	Pekin, IL	CO_2	–	Exp.	–	–	Liquid Carbonic
Miller Brewing	Watertown, WI	Hops	20	New	11.6	–	–
Moark Products	Grand Junction, CO	Egg processing		New	3	30	–
Mondo Products	Rome, GA	Confections	30	New	1.5	10	–
Monitor Sugar	Bay City, MI	Sugar, molasses		New	38	260	–
Mrs. Smith's	Rossville, TN	–	–	Renov., exp.	–	–	Fluor Daniel
N							
Nabisco	Naperville, IL	Cereal	–	Exp.	30	–	Sverdrup
National Distillers	Frankfort, KY	Whiskey, feed	–	Exp.	13	70	–
Nebraska Sioux Lean Beef	Gordon, NE	Meat packing	–	New	2.8	100	–
Nestle-Beich Candies	Bloomington, IL	Candy	9	Exp.	1.1	150	–
Nestle Co.	Fulton, KY	Chocolate	16	Exp.	10.5	–	–
Newly Wed Foods	Springdale, AR	Food coatings	–	New	8.5	60	–
New Tech Snacks	Joliet, IL	Pasta snacks	21	New	8	–	Austin Co.
Nor-Cal Wild Rice	Yolo, CA	Rice	–	Exp.	–	–	–
NorOats	St. Ansgar, IA	Racehorse feed	–	New	4.5	4	–
Nutri-Cheese	Oak Park, IL	Analog cheese	16	New	5	–	Austin Co.



Cut your location decision down to size

Delaware is the small state with big advantages for food processors. Like fast, extensive transportation systems that put you no more than a day away from one-third of America's population. An abundant, clean water supply, including the Delaware River. A growing, skilled workforce that remains very cost competitive. Plus, there's a reason you won't find on a map or in a mound of statistics: accessibility of state government.

Delaware's smaller size makes management easier, information quickly available, and real help as close as your phone. Prove it to yourself, and simplify your location decision-making. Call the Delaware Development Office. (302) 736-4271

Circle 60 on Inquiry Card

DELAWARE
SMALL WONDER

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
O							
Ogilvie Mills	Keokuk, IA	Gluten	–	Exp.	–	–	Process Systems, Inc.
Oldenburg Brewery	Fort Mitchell, KY	Beer	–	New	7.5	230	–
Olviere Ravioli	Eugene, OR	Pasta	70	New	5	40	–
Owensboro Grain	Owensboro, KY	Grain proc.	–	Exp.	4	–	–
OK Foods	Heavener, OK	Poultry proc.	–	New	–	300	–
Ocean Spray	Babcock, WI	Fresh fruit	–	Exp.	–	–	Hixson
P							
Pennant South	Dalton, GA	Frzn. bakery mix	–	New	2	25	–
Pepperidge Farm	Lakeland, FL	Biscuits	–	New	45	350	–
Perdue Farms	Manson, NC	Eggs	30	New	7	30	–
Perdue Farms	Emporia, VA	Deboned chicken	44	New	8	500	–
Piggly Wiggly Southern	Vidalia, GA	Grocery distribution	28	Exp.	1	–	The Stellar Group
Plaza Provision	San Juan, PR	Wine dist.	39	Exp.	–	235	–
Plumrose	Bonneville, MS	Boneless ham	58	Exp.	7	80	–
Potomac Food Dist.	Stafford, VA	Dry, frzn. dist.	30	New	1.5	30	St. Onge, Ruff Assoc.
Power Packaging	Manteno, IL	Food packaging	100	New	3.6	–	A. Epstein & Sons
Premier Distributing	Albuquerque, NM	Beer dist.	74	New	2.5	100	Engstrom Assoc./Armco Bldg. Systems
Premium Dairy Prod.	Decatur, AL	Dairy products	36	New	–	28	–
Processed Foods	Milbank, SD	Frozen foods	23	New	1.6	20	–
Provesta Corp.	Bartlesville, OK	Fermented products	–	New	–	–	–
Publix Super Markets	Boynton Bch., FL	Dry groc. dist.	425	New	20	120	Food Plant Eng.
Q							
Quaker Oats	St. Joseph, MO	Cereal	–	Exp.	–	–	–
Quaker Oats	Marion, OH	Pet food	–	Exp.	–	–	Austin Co.
Quaker Oats	Jackson, TN	–	–	Exp.	–	–	Fluor Daniel
Quality Foods	Little Rock, AR	Poultry	–	Exp.	8.8	124	–
Queen Anne Candy	Shorewood, IL	Chocolate candy	–	New	–	130	–
R							
Ralston Purina	Denver, CO	Pet food	–	Renov.	1+	–	Davy McKee
Ralston Purina	Dinkirk, NY	Pet food	–	Renov.	1+	–	Davy McKee
Ralston Purina	Sharonville, OH	Cereal	–	Exp.	–	–	MK-Ferguson
Randolph Packaging	Streamwood, IL	Sausage	52	New	2	69	–
R. B. Rice Co.	Baxter Springs, KS	Salads, desserts	40	New	2	60	Emil Bayerl Summit Bldgs.
Rice Snacks	Jonesboro, AR	Rice snacks	–	New	1	35	–
Rich Products	Saugatuck, MI	Frozen desserts	–	New	2.5	100	–
Richwood Meats	Merced, CA	–	–	Exp.	–	–	–
Riverbend Int'l.	Yuma, AZ	Tomato proc.	–	Exp.	5.5	–	–
Robinson Cone	Burlington, ON	Ice cream cones	–	New	1.3	–	–
Rocco Farm Foods	Shenandoah Cty., VA	Chicken proc.	100	Exp.	11	–	–

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Rocco Turkeys	St. Paul's, NC	Turkey proc.	–	New	15	300	–
Rock River	Wauconda, IL	–	–	New	–	–	–
Rose Acre	Winterset, IA	Eggs	–	New	11	118	–
Rove Enterprises	Miami, FL	Proc. foods	–	New	2	80	–
Royal Dutch Products	DeLand, FL	Dutch cheese	50	New	8	30	–
Royal Gulf Tuna Swordfish	Terrebone Psh., LA	Fish proc.	–	New	4	–	–
Rudy's Farm Co.	Little Rock, AR	Bakery products	–	Exp.	–	40	–
S							
Safeway Stores	Emporia, KS	Canned pet food	41	New	–	25	–
Sara Lee	Tarboro, NC	–	–	New	–	–	Fluor Daniel
Savannah Food Svs.	Jackson, MI	Proc. sugar	25	New	1.5	25	–
Schuler Foods	Marshall, MI	Soups, sauces	–	New	3	75	–
Schwann Enterprises	Lawton, OK	Frozen foods	–	New	2	–	–
Seaboard Tampa Terminals	Tampa, FL	Frzn. food, refrig. dist.	450	New	6	–	The Stellar Group
SeaFest Products	Motley, MN	Surimi products	43	New	7	–	–
Seafood Cannery	Steinhatchee, FL	Crab proc.	–	New	0.2	60	–
Setton Int'l. Foods	Madera, CA	Pistachios	–	New	–	–	–
Seven-Up/RC Bottling	Lenaxa, KS	Soft drinks	57	New	2.5	–	–
Shedd's Food Products	Baltimore, MD	Dist. center	28	Exp.	2.9	25	–
Simmons Industries	Southwest City, MO	Poultry	26	Exp.	–	–	–
Simon Bros. Bakery	Skokie, IL	Bakery products	28	Exp.	0.7	–	–
Smith's Frozen Foods	Weston, OR	Frozen veg.	–	Exp.	5	–	–
Spectrapak	Riverside, CA	Ice cream novelties	23	New	–	50	–
Staley Continental	Louden, TN	HFCS	–	Exp.	–	–	Process Systems, Inc.
Stilwell Foods	Stilwell, OK	Frozen foods	–	Exp.	–	64	–
Stouffer Foods Corp.	Springville, UT	Frozen entrees	360	New	75	1200	–
Stout Enterprises	Laurinberg, NC	Feed mill	–	Exp.	4	–	–
Stroh Brewery Co.	Memphis, TN	Malt coolers	–	Exp.	–	–	–
Sugiyo USA	Anacortes, WA	Seafood	–	New	9.6	200	–
Sugiyo USA	Wenatchee, WA	Seafood paste	–	New	25	200	–
Sunfield Foods	Sacramento, CA	Health foods	52	Exp.	–	25	–
Sunpac Foods	Brampton, ON	Pet food	100	New	–	–	–
Sunshine Feed Mills	Halifax Cty., VA	Dog, cat food	60	New	4	100	–
T							
Takeda USA	Wilmington, NC	Vitamin C	–	New	70	–	Davy McKee
Teepak	Danville, IL	–	–	New	–	–	Fluor Daniel
Tholstrup Cheese	Norton Shores, MI	Spec. cheese	21	New	2.6	20	–
Tombstone Pizza	Sussex, WI	Pizza	54	Exp.	6	55	–
Tropicana Products	Bradenton, FL	Orange juice	53	Exp.	–	–	–
Tulsa Turkey Products	Tulsa, OK	Turkey proc.	56	New	–	100	–
Tyson Foods	Ashland, AL	Poultry products	–	Exp.	3	350	–
Tyson Foods	Attalla, AL	Poultry feed	20	New	5	75	–
Tyson Foods	Blountsville, AL	Poultry products	–	Exp.	8	100	–
Tyson Foods	Ivalee, AL	Feed mill	–	New	5	25	–
Tyson Foods	Green Forest, AR	Poultry products	–	Exp.	13.7	1000	–
Tyson Foods	Rogers, AR	Poultry products	–	Exp.	5	–	–
Tyson Foods	Van Buren, AR	Poultry products	–	Exp.	4.9	200	–

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Tyson Foods	Broken Bow, OK	Poultry products	–	New	–	250	–
U							
UBA Trading Co.	Cambridge, ON	–	60	New	1.5	60	–
Uncle Ben's	Greenville, MS	Rice milling	–	Exp.	16.6	50	–
Uncle Wong Food Products	Radisson, NY	Frzn. Chinese foods	40	New	3	120	–
Uni-Kool	Monterey Cty., CA	Ice	–	Exp.	–	–	–
United Foods	Ogden, UT	Frozen veg. dist.	200	New	4	60	–
United Refrig. Services	Birmingham, AL	Frozen foods	28	Exp.	1.5	–	The Stellar Group
United Refrig. Services	Atlanta, GA	Frozen foods	84	Exp.	4	–	The Stellar Group
U.S. Cold Storage	Lumberton, NC	Frozen meat, poultry	115	New	6	–	The Stellar Group
U.S. Cold Storage	Nashville, TN	Frozen foods	90	New	5	–	The Stellar Group
V							
Val Blatz Brewery	Milwaukee, WI	Beer	40	New	6	15	–
Vandervoort Dairy	Ft. Worth, TX	Fluid Milk	–	Renov.	–	–	Hixson
Van Duyn Choc. Shops	Eugene, OR	Chocolate	100	New	5	300	–
Very Special Chocolate	Los Angeles, CA	Choc. candy	–	Exp.	–	–	–

How to

nearly as

Twin screw extrusion makes a difference

It takes time to plan and formulate new products, even longer to invent and refine process technology to make them.

When you plan new products with Clextral twin-screw extrusion in mind, process goals won't seem out of reach. Clextral's modular design lets you heat, cool, mix, shear, de-gas and inject at any point along the processing barrel. So you save time in development and in production.

NEW FOOD PLANTS

Company	Plant Location	Primary Product	M Sq. ft	Type Project	Est. Cost ($ millions)	Employ-ees	Architects/ Engineers
Vita Food Products	Bronx, NY	Fish processing	45	New	4.5	–	A. Epstein & Sons
Vitner Chips	Loves Park, IL	Snack foods	–	Exp.	0.6	80	–
Vlasic Foods	Greenville, MS	–	–	Exp.	1.9	60	–
W							
Waterloo Meat Packing	Waterloo, IA	Meat packing	–	New	25	250	–
Wayne Poultry	Union Springs, AL	Poultry products	–	Exp.	–	100	–
Wayne Poultry	Danville, AR	Poultry products	–	Exp.	2.5	125	–
Westco Drying	Desert Hot Springs, CA	Acoustic drying	12	New	2.5	12	U.S. Dev. Corp.
Western Idaho Potato	Jerome, ID	Frzn. potato prdts.	–	New	–	120	–
Western KY Coca-Cola	Bowling Green, KY	Coca-Cola	–	Exp.	1.5	–	–
Western Sugar	Ft. Morgan, CO	Sugar-beet proc.	–	New	1.4	–	–
Wilson Foods	Oklahoma City, OK	Edible oil	–	Renov.	5.8	–	Process Systems, Inc.
Wis-Pak	Watertown, WI	Soft drinks	–	Renov.	–	–	MK-Ferguson
W. J. Powell	Thomasville, GA	Frozen foods	300	New	–	–	–
Wornick Co.	New Braunfels, TX	Microwave entrees	80	New	–	175	–
Wyoming Meat Packers	Riverton, WY	Meat packing	–	New	4	300	–
Z							
Zachary Confections	Frankfort, IN	Chocolate spec.	–	New	–	100	–

velop new products
ast as he can eat them.

Ingredient flexibility makes a difference

Clextral cooker/extruders let you use the complete range of economical, readily available ingredients, from fine powders to whole grains, and still maintain product quality.

Clextral's special combinations of long-wearing metals even make it possible to process corrosive or abrasive materials.

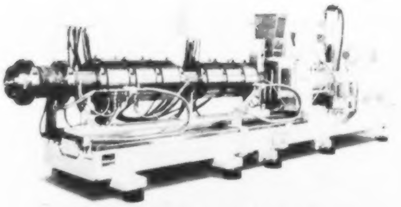
So you won't lose time juggling product formulations just to accommodate processing equipment.

Clextral makes a difference

Hundreds of successful products have come from our twin-screw extrusion technology: breakfast cereals, snacks, flatbreads, pastes, confections — even fish and pet foods.

Bring your new product ideas to our pilot plant and we'll demonstrate what twin-screw extrusion can do. Clextral knows twin-screw extrusion because we invented it. Write or call us soon for an appointment.

Clextral. We make a difference.



CLEXTRAL

2150 Byrd Drive
Odessa, FL 33556
813-920-2293

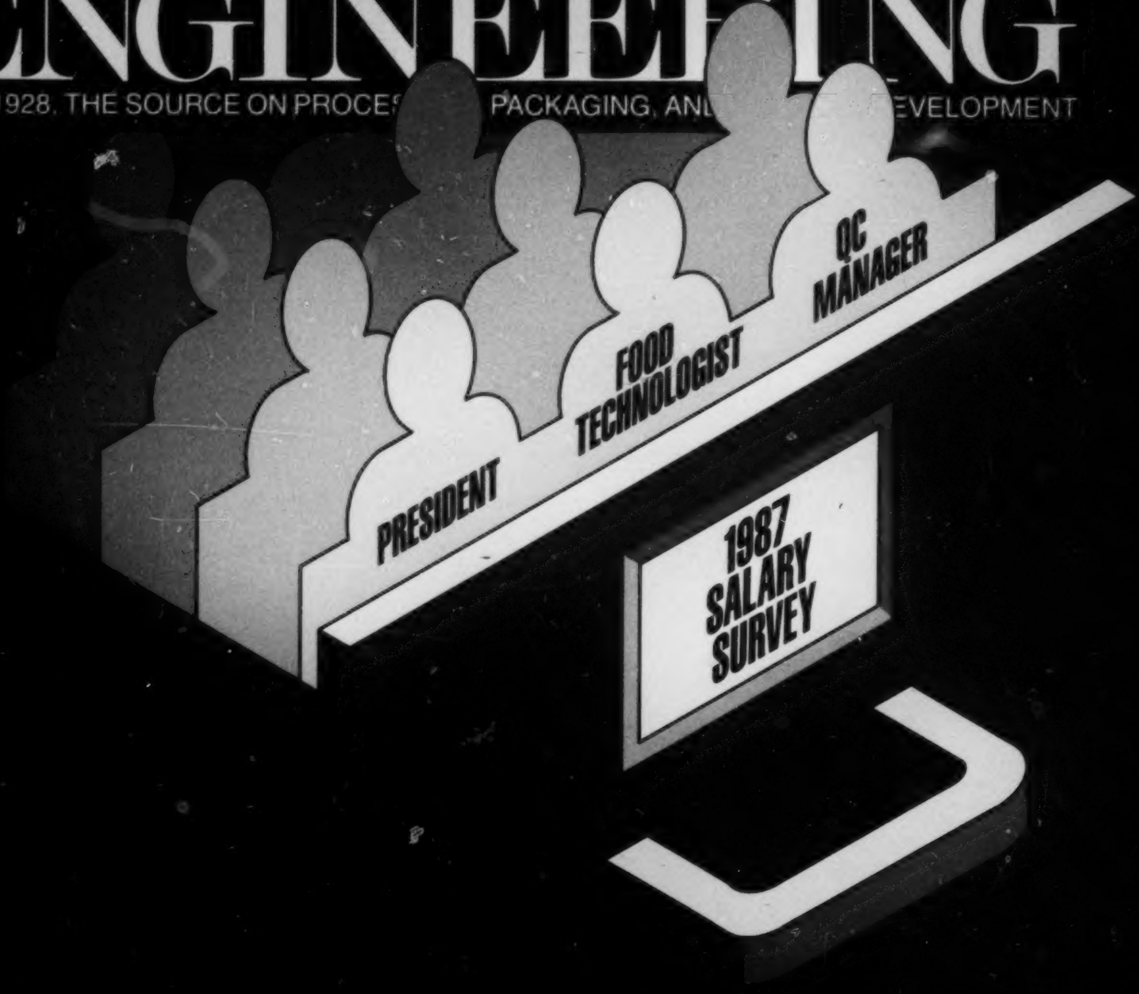
In Canada, contact Solac Ltd
514-932-4433 (Montreal)
416-270-8200 (Toronto)

CHILTON'S
DECEMBER 1987

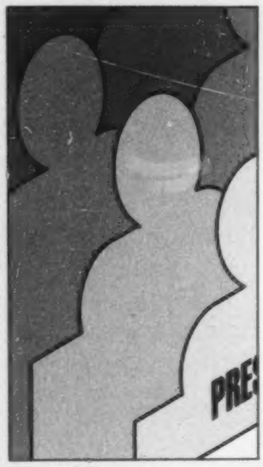
FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCES PACKAGING, AND EVELOPMENT

C2150-6
12/28/87


PRESIDENT
FOOD TECHNOLOGIST
QC MANAGER
1987 SALARY SURVEY

FOOD ENGINEERING



COVER STORY

Are you getting what you're worth? *Food Engineering's* annual salary survey gives you the lowdown on what you and your colleagues are earning.

Pages 73 to 78

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) December 1987, Vol. 59, No. 12. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ™Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

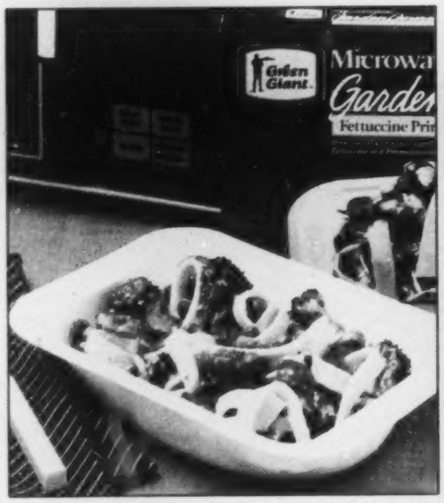
News

13 Industry Report

This month's Report talks about how processors are eager to get into the continuously processed, low acid particulate products arena; FDA's acceptance of NutraSweet's filing for the use of aspartame as a sweetener in bakery products and baking mixes; an MIT professor's call for food additives to be regulated in the same manner as drugs; and a prediction that the fat replacer, olestra, will be approved by 1989.

Departments

9 Editorial
10 Calendar
13 Industry Report
35 Marketplace
122 New In Print
138 People



CONVENIENCE FOODS: PAGE 35

Food Packaging

48 CAP '87

A report on the events at the Third International Conference on Controlled/Modified Atmosphere/Vacuum Packaging.

54 CAP Conditions

CAP is not simply a matter of gas flushing a food package. There are several critical criteria which must be met.

57 CAP Microbiology

The CA/MA/vacuum packaging of fresh refrigerated foods involves health risks which must be evaluated and minimized.

62 Creativity

Sometimes it is worthwhile to search for innovative products outside the confines of your own corporation.

63 Polycarbonate

A new polycarbonate resin with a wider processing temperature range, has made PVDC coextrusion possible.

66 Literature

PRE-COOKED MEATS: PAGE 63

CHILTON
FOOD
GROUP

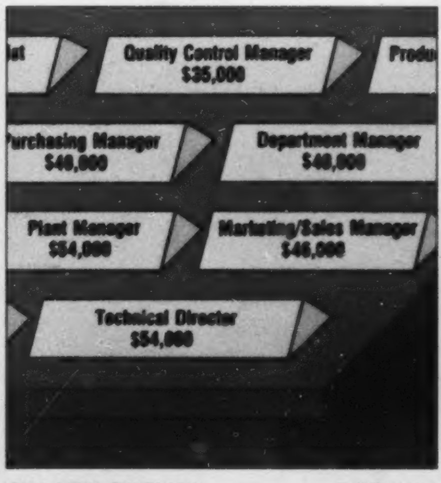
Features

73 Salary Survey
Food industry salary increases stay with the national average of 4-6 percent, just ahead of the inflation rate.

81 DFISA Show Report
Emphasis by equipment manufacturers was on meeting FDA safety concerns and automation at the largest Dairy and Food Industries Supply Association Show ever.

97 Microbiology
The microbiological food safety war is far from over; and is more than ever a group effort involving everyone in a company.

105 Pumps & Valves
Suppliers re-emphasize sanitary design in the wake of FDA's dairy initiative. Modular design improves availability, boost maintenance and process efficiency. New pumps protect product particulates, texture, mouthfeel.



SALARY SURVEY: **PAGE 73**

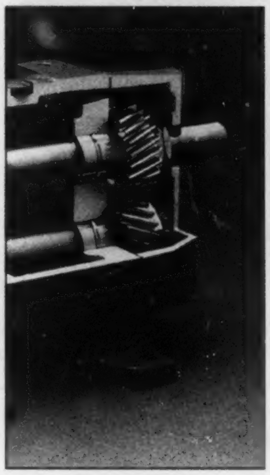
From the Field

108 Control system improves product yield in beverage plant.
114 Newly patented hot-fill system offers alternative to aseptic packaging.
118 New probe tests for Listeria; identification within 48 hours.
119 Aquaculture technology spurs growth in the catfish industry.
120 Commercial sonic-assisted drying plant starts-up in California.

New Equipment

127 Processing Equipment
128 More product news from the Food & Dairy Expo

CONTROL SYSTEM: **PAGE 108**



Special Emphasis

PUMPS, VALVES FOCUS ON SANITARY DESIGN

Recent developments in food processing have focused attention on three aspects of these versatile pumps: Sanitary design, modular design, and their ability to handle viscous and particulated products.

Pages 105 to 107

Microwave oven uses spread as ownership increases

Microwave Oven Uses

	Often	Sometimes	Never
Warming leftovers, etc.	81.7%	15.7%	2.7%
Thawing frozen foods	50.3	41.7	8.0
Cooking frozen foods (vegetables, entrees, etc.)	48.7	37.7	13.7
Cooking non-frozen foods	38.7	50.3	11.0
Full meal preparation	9.3	33.7	57.0
Adapting conventional recipes	7.3	32.0	60.7
Cooking recipes from scratch	7.3	28.0	64.7

Source: Good Housekeeping Institute

While the reheating of leftovers is still their main use, microwave ovens are seeing a great deal of applications for cooking frozen vegetables and entrees, as well as the preparation of non-frozen foods.

A Good Housekeeping Institute (GHI) survey, conducted for the Association of Home Appliance Manufacturers indicates that the microwave oven is not used simply for popping corn or boiling water anymore. As indicated in the accompanying chart, microwave ovens are used regularly for warming leftovers, thawing frozen foods, and cooking frozen and non-frozen foods.

As of mid-year, approximately two-thirds of the 88.8 million households in the U.S. owned at least one microwave oven, according to industry estimates, with that figure expected to increase to over 70 percent by year end. Among the owners surveyed by GHI, five percent own more than one microwave. According to a June industry forecast, factory shipments of the ovens are expected to reach 12.39 million units this year, down slightly from last year's 12.44 million units.

A family appliance

Over 91 percent of the surveyed owners say that other household members also use the appliance, and working women report even greater use of the appliance by their families. For example, about 95 percent of husbands of working women use the microwave, and almost 45 percent of the working woman's children, ages 10-17 use the appliance.

According to the survey, on the average, the microwave oven is used four times daily, with at least 25 percent of the owners using it six or more times per day. More than half of the owners use the oven frequently for dinner, almost half use it frequently for snacks and better than a third use it frequently for breakfast and lunch.

Between one-half and one-third of those surveyed said they never use the microwave for full meal preparation, for adapting conventional recipes and for cooking recipes from scratch. However, GHI has found that this reluctance is diminishing as more and more information is offered to the microwave oven owner.

The survey points out that there is no longer a "typical" microwave oven owner. Due to the convenience offered by the appliance, ownership now cuts across all age, income and educational levels and household types.

MIT professor calls for rigorous additive tests

Food additives should be tested, evaluated and regulated in nearly the same rigorous manner as medical drugs, said Richard J. Wurtman, MD, an MIT physician/scientist, in testimony before the U.S. Senate Labor and

(Continued on page 31)

RAPID MIXER: dissolves solids and powders in minutes

Rapid Mixer disperses or dissolves solids or semi-solids in water or non-aqueous media quickly and thoroughly.

Its heavy-duty impeller circulates the media up the vessel walls and down the liquid center for both maximum mixing and maximum exposure of product to heat transfer surface.

Unique channel-wall construction makes possible optimum heat transfer and control.

Vessel sizes range from 50 to 300 gallon capacities with special sizes available on request.

Rapid Mixer is ideally suited for applications in such industries as:

Bakery
Beverage
Cosmetics
Chemical
Dairy
Food
Pharmaceutical

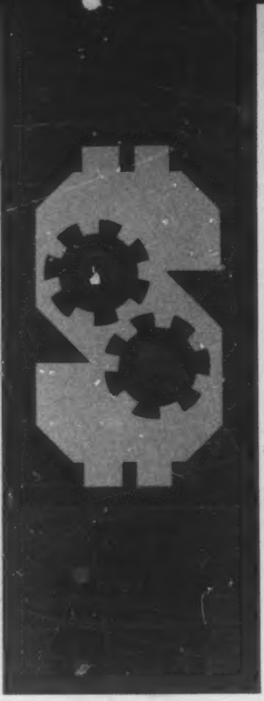
For detailed application specifications, write or call for your copy of brochure SB-1223:
Cherry-Burrell Corporation,
P.O. Box 3000, Cedar Rapids,
Iowa 52406;
1-800-553-8867.

Dissolve solids and powders in minutes with
RAPIDMIXER
by CHERRY-BURRELL

CHERRY-BURRELL
AMCA INTERNATIONAL
®

Circle 27 or see FEM, p. 92

INCREASES AKIN WITH U.S. AVERAGE



Food industry salary increases stay with the national average of 4 to 6 percent, keeping up with, or just ahead of, the inflation rate.

Whether you're the apple of your boss's eye, last on his list, or somewhere in between, negotiating for salary or asking for a raise is rarely easy. But *Food Engineering's* annual salary survey can help make it a little easier for you to find out where you stand, and if you're getting what you're worth.

Each year, *FE* surveys 10,000 industry professionals, asking how much they make; if they received a raise; position and years of experience; product specialty and education level. Those surveyed are then given free reign to comment on life in the workplace; if their career futures look optimistic or pessimistic; and anything else about how they are compensated.

Chilton Research Services tallied the responses of over 1,200 food industry professionals, spanning all levels of management as well as job titles, product specialties and areas of the country.

According to *FE's* survey, salaries for most in the food industry in 1987 rose 4 to 6%, just like the national average reported by other general business salary surveys such as the Business and Legal Reports and Personnel Management Services which projected increases of 4.60 to 6.225% for 1987.

The responses showed that median salary for all food industry workers in 1987 was $44,000, up 7.3% from last year. The majority of those workers with under 20 years experience are right in line with the national average and received a 4-6% increase, according to our survey. We found, however, that those with over 20 years of experience received somewhat bigger than average increases, causing our median to surge slightly higher for all workers.

As far as percentages go, the majority, or 16.8% of the respondents, received a 5% increase; 12.1% received a 6% pay increase; while 9.6% received a 4% pay increase.

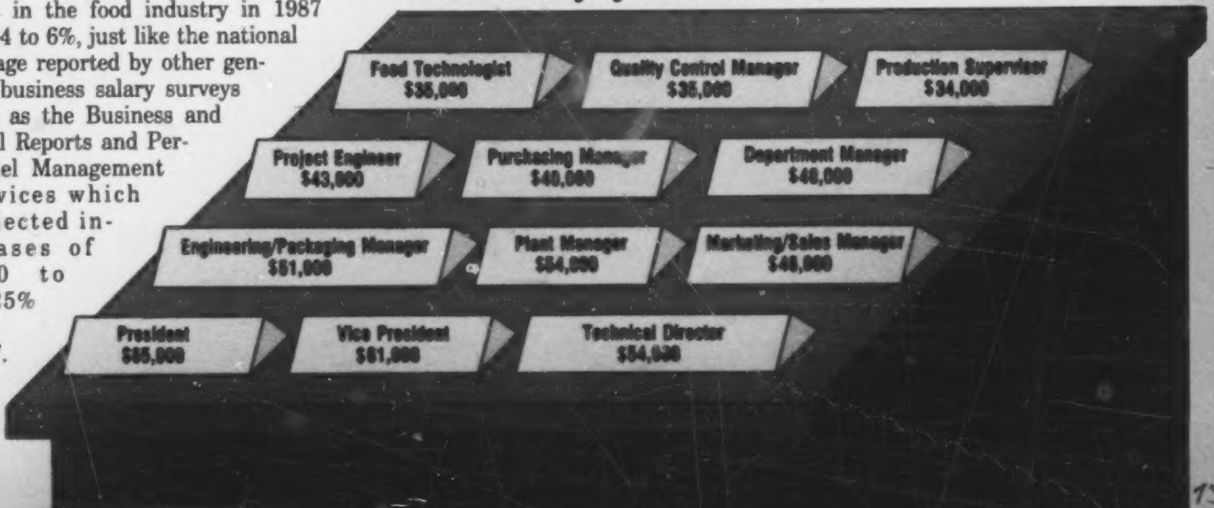
Unfortunately, some reported no increase. Almost as many people received no increase (16.1%) as received a 5% increase. And, 9% of respondents received 3% or lower.

The median number of years of food industry experience for all workers checked in

(Continued on page 75)

JOYCE FASSL
Managing Editor

Median Salary by Job Title



(Continued from page 73)

at 13.83. The median figure for company presidents is 23 years of experience, with a median salary of $65,000 per year. On the low end of the experience scale, food technologists logged 10.47 years, earning $35,000 per year. QC managers are earning a median salary of $35,000 after almost 13 years of experience, while department managers are making a median salary of $40,000 after the same amount of experience.

Making the most

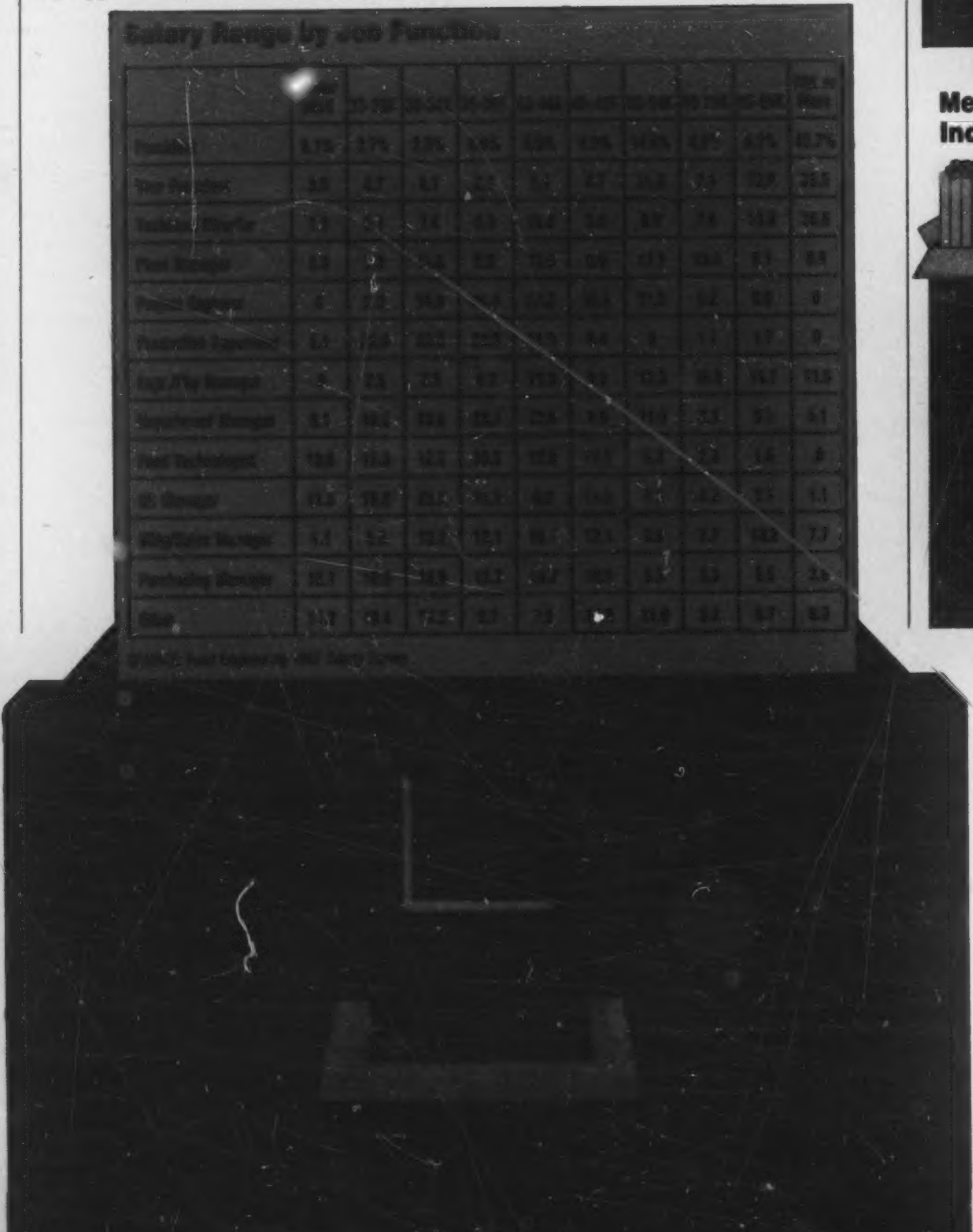
Pasta, beverages, seafood and grain milling topped the charts as the four highest median salary areas by product specialty. And the largest companies pay the most – a median salary of $50,000. So, where's the best place to be working, salary-wise, in 1987? A pasta plant in the West South Central region of the country with over 2,500 employees.

The West South Central led the pack for highest median salary by region of the country with $45,000, followed closely behind by four other regions, each at $44,000.

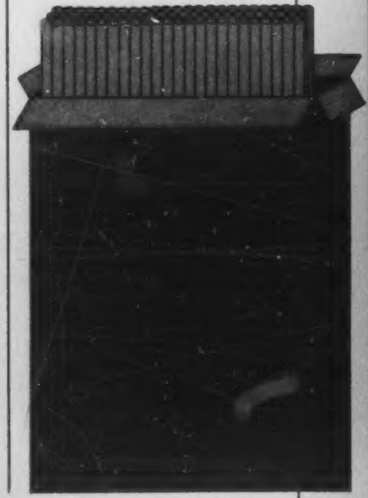
So, not surprisingly, those in the West South Central were more optimistic about their future careers than any other region. 83% of workers in this region said the fu-

(Continued on next page)

Salary Range by Job Function



Median Salary by Industry



Median Salary by Geographic Region

SOURCE: Food Engineering 1987 Salary Survey

Median Salary by Food Industry Experience

(Continued from previous page)

ture was positive, 9 percentage points higher than the national average of 75%.

The reasons people were optimistic about the future? The company is growing, there is opportunity for advancement, and the industry itself is expanding.

Increased responsibilities

While most of *FE's* survey respondents were optimistic about their careers, more than half cited increased responsibility as greatly affecting their daily work.

60% of the respondents claimed that their job responsibilities had increased over the past year. The highest percentage was for QC managers, where 76% claimed that they had taken on additional work. Close behind were production supervisors and purchasing managers. In the other job categories, over 50% of the respondents said that their responsibilities had increased. The only exception were presidents; but even there, only 43% were doing more work.

Of all those respondents making under $40,000, over 65% said their responsibilities had increased. Only half of those making over $40,000 said their responsibilities increased. Surprisingly, making more money may not always mean having to bear more responsibility or a heavier workload.

Quality of life

Another area where the majority of our respondents were optimistic was their feeling about the quality of life in the workplace and whether it was improving or worsening. 60% felt it was improving; while 30% said it was worsening; only a small number saw it as static.

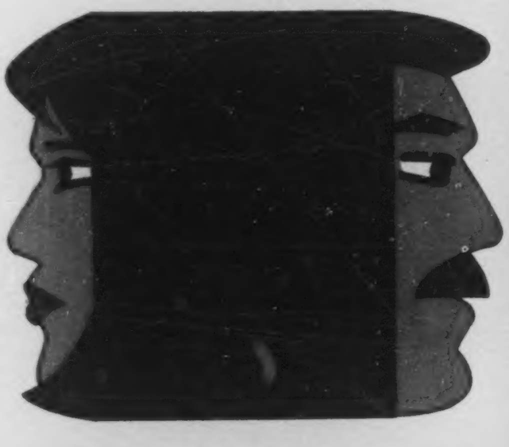
A QC manager from Maryland with over 20 years of experience told *FE* that companies can no longer afford the luxury of employees covering a narrow line of duties. This has forced employees to become more versatile, covering a wider range of duties, while receiving less compensation for the job, he said.

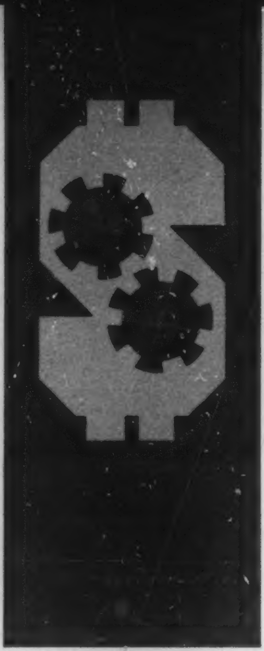
Fear of mergers caused stress for some of our respondents. A food technologist from New Jersey told us that due to a merger her department was cut to one-third of its original size, but the volume of work remained the same. And a New York food technologist told us that insecurity is rampant in her company due to a wave of mergers and acquisitions. A project engineer shared in the concern. "The threat of a takeover or merger can cause total chaos in a company."

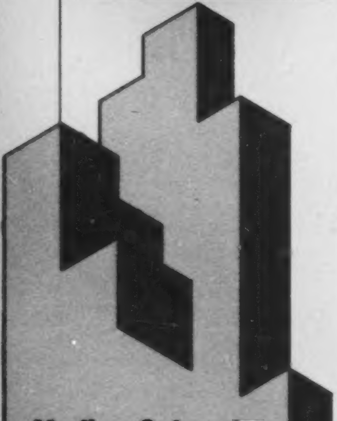
Incentives

Though not too many solutions to food industry problems were offered by our respondents, a few suggested incentive plans as a way to boost morale, quality and productivity. An account manager from New Jersey said, "Bonus incentives would be advantageous to all personnel, no matter which

(Continued on page 78)





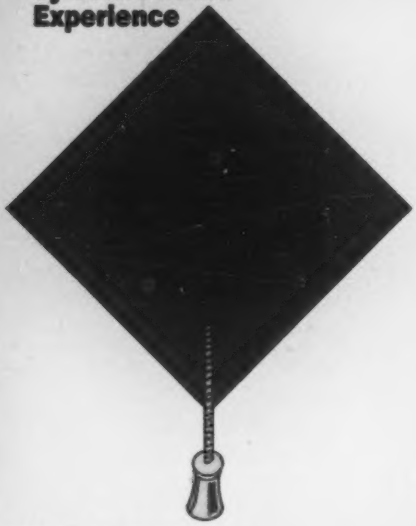


Median Salary by Company Size

Number of Employees	Median Salary
Under 20	$34,000
20-49	40,000
50-99	38,000
100-249	41,000
250-499	41,000
500-999	45,000
1000-2499	44,000
2500 or More	50,000

SOURCE: Food Engineering 1987 Salary Survey

Median Salary by Educational Experience



(Continued from page 76)

field—technical, sales or operations." A technical director, also from New Jersey, said that life in the workplace is worsening due to a lack of incentive programs for middle management. And a QC manager from California believes that incentive programs can make the difference. While relatively new for his level of management and for his company, he explained that an incentive plan "makes you feel efforts are paying off."

Women make headway

Although many of the women surveyed said they are still underpaid and must work harder than men in the food industry, some improvements are evident.

A food technologist from California with 6-9 years experience was one of the more optimistic. "I see the quality of worklife improving. We've [women] had to kick some doors down, but we've stayed and are recognized." A QC manager from Georgia agrees. "Female managers generally work harder for the same recognition and salary rewards, but thank heavens our abilities are finally being recognized by the men we work for."

Many other women are not as optimistic. "Men still make more money even if jobs are equal," says a female packaging manager who makes in the $30-35,000 range after 10-14 years. "The answer?" she continues. "I'm not sure, but I never give up trying."

An R&D director from Kansas says that female managers in the meat industry are underpaid and in the minority. "Men in similar positions often have VP after their names—women are directors and managers, but job responsibilities are equal."

A California chemist reported that the male employee doing the very same job before her received almost double her pay. "Don't tell me women's pay is equal," this 15-year food industry veteran told *FE*.

We also heard from a few men who had problems with reverse sex discrimination. One QC analyst from Pennsylvania told how another analyst was hired for $8,500 more than he. Although the new analyst had her director's license when she was hired, our respondent acquired his shortly thereafter, but is still not nearly at the same wage level.

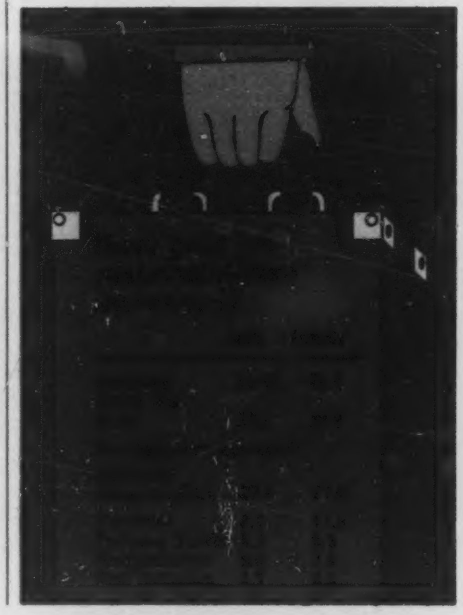
What's your beef?

Salary discussions always bring out emotional responses. Many in the food industry are facing the fact that merit increases do not come from hard work in this era, and several respondents complained that some of the people working with them don't take pride in their work.

"Innovation and accomplishment are not rewarded," says a project engineer. "Yes-men and B.S. artists get the raises first." A plant manager echoes the lament, "Experience and knowledge are no longer a strong asset when seeking employment."

The biggest beef from an Illinois chemist was that his company has had 15 consecutive years of record profits, but gives raises equal or just above the inflation rate.

Although not encouraging to hear, many of these complaints are echoed around the country, regardless of industry. But for the most part, food industry professionals are optimistic about their careers and their industry. And while some may have not received the increase they thought they were worth, they are still at least keeping up.

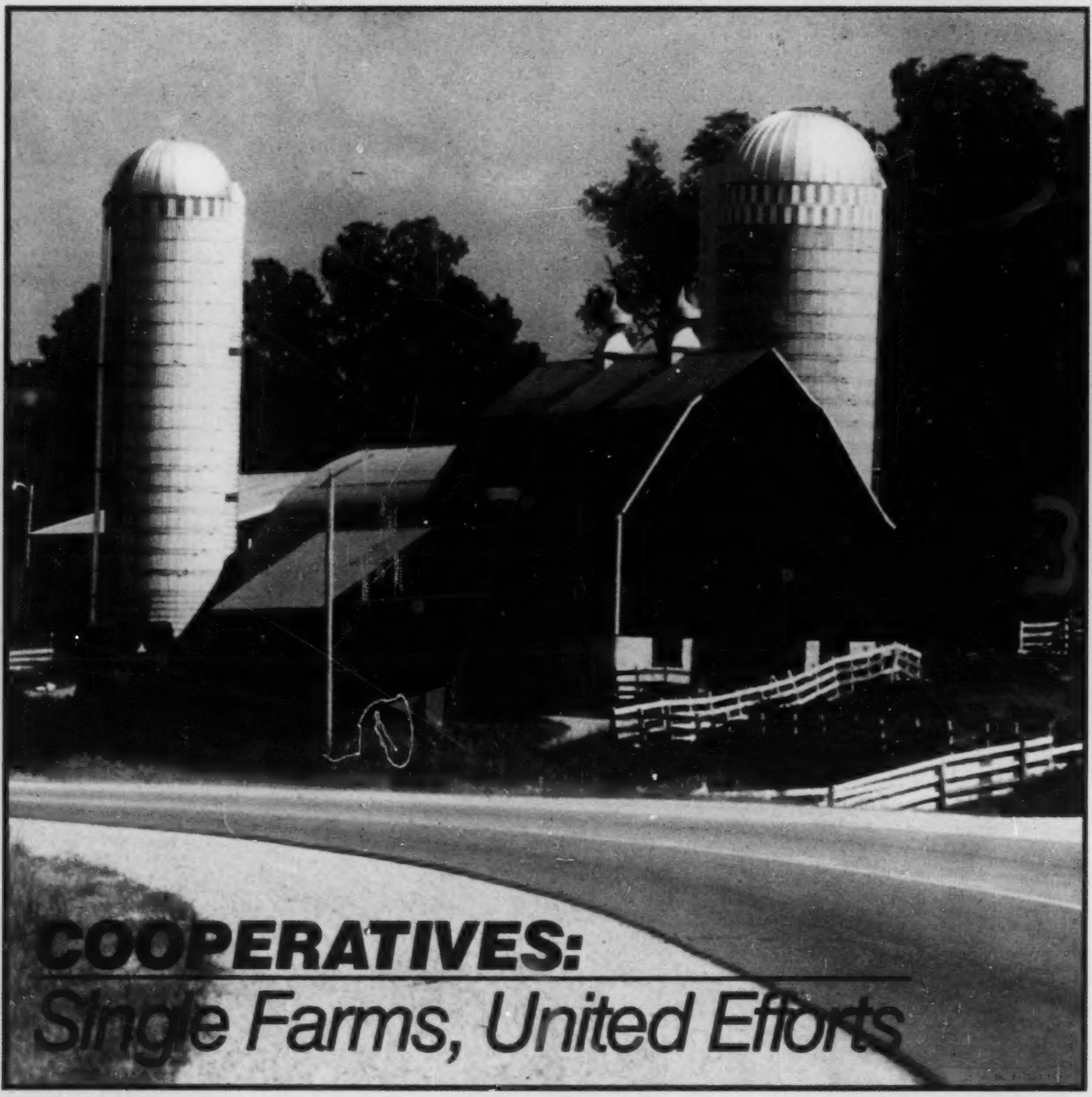


C2150-6

CHILTON'S JANUARY 1988

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT



COOPERATIVES:

Single Farms, United Efforts

FOOD ENGINEERING

COVER STORY

Farmers are surviving by being members of one of more than 5,600 farmer cooperatives. Co-ops help farmers cope with over-capacity, low commodity prices, falling land values, serious credit problems and financial stress.

Photo courtesy of Associated Milk Producers Inc.

Pages 68 to 76

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) January 1988, Vol. 60, No. 1. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co. is a division of American Broadcasting Companies, Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box 2035, Radnor, PA 19089.

News

15 Industry Report

This month's Report talks about Rutgers University's plan to build a $6.8 million research center for Advanced Food Technology; the National Restaurant Association's prediction of $213.5 billion for total sales in 1988; and highlights of two upcoming conferences—National Food Processors Association scheduled for Orlando in February, and Pack Alimentaire scheduled for San Francisco in March.

Departments

9 Editorial
10 Calendar
15 Industry Report
31 Marketplace
41 Packaging
176 New In Print
188 People

CAP: **PAGE 41**

Engineered Foods

49 Surimi & Meat Blend

Surimi offers functional advantages in processed meats but is high-priced and needs USDA clearance. R&D aim at solutions.

54 Sweeteners

The future of low calorie sweeteners in the U.S. and abroad was analyzed at the Calorie Control Council's last annual meeting.

57 Microwave Ovens

A new generation of foods is appearing—those designed for microwave-only preparation.

64 Natural Colors

Although more costly to use, natural colors are popping up on the label more and more due to marketing demands.

66 Literature

NATURAL COLORS: **PAGE 64**

Features

68 The Co-op Strategy
The last few years haven't been easy ones for U.S. farmers. The way some have survived and prospered is almost as old as the ag industry itself: Co-ops.

79 Aids and the Food Worker
The time has come for food companies to assess what may be the implications of AIDS for themselves, their workers, and the manufacturing process.

84 Opening the Iron Curtain
Eastern Europe is an untapped market for American-style convenience foods, opening joint-venture opportunities for U.S. food processors. But prepare for the long haul, not short-term profits.

87 Canning Machinery
Closing and inspection systems offer speed and efficiency to the can line. But the metal can line may be affected by a new force in packaging design: plastic cans.

BEHIND THE IRON CURTAIN: PAGE 84

From the Field

91 Visual inspection system focuses on quality control
93 PCs design modifications for major brewer
94 Liquid nitrogen injection pressurizes food cans
95 Fluid power technology offers industry unique capabilities
96 Polarography advances make system useful in monitoring
98 Tamper-evident tank car protects bottlers' corn syrup
99 Ohmic heating alternative for processing viscous foods.

New Equipment

179 Processing Equipment
183 Packaging Equipment
186 Instruments/QC

CAN PRESSURIZATION: PAGE 94

Special Emphasis

CANNING MACHINERY

The advent of plastics has meant severe competition for the canning industry. But, recent trends indicate that metal can manufacturers can expect significant growth over the next decade.

Pages 87 to 90

New product possibilities with

POLYMER COATINGS

You can now film coat a diverse selection of foods, snacks and confectionery items to give them gloss, color, and even flavor. Opadry Type F provides you with an important tool in improving or developing new foods.

- Visually enhance and add excitement to your existing products
- Create appealing new line extensions
- Unmatched product design potential
- Rapid processing times increase your production

Potential applications for Opadry Type F are limited only by your imagination. The possibility exists for coating:

NUTS AND NUTMEATS
GUMBALLS
COMPRESSED CANDY
SEEDS
EXTRUDED FOODS
CEREALS
SNACK FOODS
NON-PAREILS
DRIED FRUIT
JELLY BEANS
GUMS
JIMMIES
MINTS
DEXTROSE CANDY
And many, many more

Call or write today to see how the unique characteristics of

OPADRY TYPE F
Film Coating Concentrate

can provide you with exciting new product possibilities.

215-699-7733

Colorcon

Moyer Blvd., West Point, PA 19486

NRA predicts foodservice industry sales to top $200 billion in 1988

FOODSERVICE SALES PROJECTIONS

	1985 Estimated Sales	1987 Projected Sales	1988 Projected Sales	'85-'88 Growth Rate
Eating & drinking places	$120,026	$137,780	$147,838	7.2%
Food contractors	9,460	10,774	11,550	6.9
Lodging places	10,698	12,340	13,303	7.5
Misc. commercial	12,679	15,213	16,640	7.4
Institutional foodservice	21,025	22,277	23,145	3.2
Military foodservice	877	967	1,050	6.2
Total	**$174,766**	**$199,371**	**$213,526**	**6.9%**

(All figures are in $millions) *(Source: The National Restaurant Association)*

The NRA's foodservice sales projections are broken down by major area. Total sales are expected to top $200 billion for the first time in 1988.

National Restaurant Association President Michael Grisanti has announced that the association is forecasting $213.5 billion in total sales for foodservice in 1988. The forecast is based on predictions that national economic growth will continue the course of expansion begun in 1982. However, Grisanti cautioned that foodservice industry sales are closely tied to the welfare of the general economy.

"The significant stock market decline which occurred on October 19 and the fluctuations that have occurred in subsequent weeks certainly must be considered when evaluating the economy," said Grisanti. However, he reported that the Conference Board, a major business and consumer research organization, took a poll immediately after October 19 and found that consumer confidence in the overall economy dipped only slightly as a result of the stock market decline. "The underlying strength of the economy remains sound," said Grisanti. Because of these economic reasons, food and drink sales for the foodservice industry are projected to increase by $14.2 billion in 1988, a 7.1 percent advance.

Restaurants and lunchrooms, which account for one-third of total industry sales, are expected to post sales of $70.6 billion, up from 66.1 billion in 1987. Limited menu restaurants (primarily fast food), will continue to outpace industry-wide growth, with sales projected to reach $60.4 billion for an 8.5 percent increase. Bars and taverns should see a sales advance of 4.5 percent in 1988, to $9.6 billion. Sales at lodging places should reach $13.3 billion for a 7.8 percent increase.

Menu prices are expected to advance 4.2 percent in 1988, slightly below the projected rate of increase for the Consumer Price Index, primarily because of low projected increases in wholesale food prices (1.6 percent). Industry labor costs are forecast to advance 4.0 percent in 1988, following a 3.6 percent rise in 1987. Low unemployment rates, combined with a continuing decline in the number of teenagers in the labor force should exert upward pressure on wages.

According to Grisanti, continued foodservice industry growth is a result of focusing on long term trends as opposed to short term fads. "Adaptation to consumer demand," said Grisanti, "is the reason why we will top 200 billion dollars in 1988 sales."

New name is sought for 'aseptic' technology

The National Food Processors Association's Aseptic Affairs Committee is sponsoring a contest to develop a new term to describe "aseptic" processing and packaging. The contest is intended to uncover a new name that will more attractively and accurately communicate the attributes of aseptics. Savings bonds will be awarded to the top five recommendations.

Submissions are due by February 1 to NFPA, 1401 New York Ave., N.W., Washington, DC 20005. For more information call Ellen Morton or Dorsey Davidge of NFPA at (202) 639-5900.

Circle 25 or see FEM, p. 95

Fierce competition ahead for low-calorie...

Sweeteners

The future of low calorie sweeteners in the U.S. and abroad was analyzed at the Calorie Control Council's last annual meeting.

As the U.S. FDA evaluates food additive petitions for four new low-calorie sweeteners, toxicology work is underway on several other sweeteners with hopes of submitting petitions for them by 1990. And sophisticated research is aimed at developing even more low-calorie sweeteners.

At the Calorie Control Council's (CCC) annual meeting, held last October, reports were given on new sweetener research and international sweetener regulations. But as more sweeteners are on the horizon awaiting approval, Raymond Gill, Deputy Director of the Office of Compliance, FDA, pointed out that the public is demanding higher standards of safety.

Aspartame: Dr. Sam Molinary, Vice President, Regulatory Affairs, The NutraSweet Company, spoke about the lessons learned in seeking, obtaining, and maintaining worldwide approvals. **Circle 250**

"If you plan to file an additive petition, make sure the scientific data is sound, and make sure the user industry is behind you," Molinary stressed.

Saccharin: Dr. James Emerson, Director, External Technical Affairs, The Coca-Cola Company, said that while a lot of theories exist on how saccharin acts in the body, there is very little proof for any of them. Ongoing research continues to examine saccharin's effect in the body.

Cyclamate: William T. Miller, Vice President, Royal Crown Cola Co., gave the regulatory history (*see Food Engineering, November 1985, p.67*). Miller announced that by November, 1987, all the studies requested by FDA in connection with the petition submitted by Abbott Laboratories and the CCC requesting approval of cyclamate usage in the U.S. will be completed.

Miller concluded by saying that cyclamates are valuable because of their taste, stability, and cost.

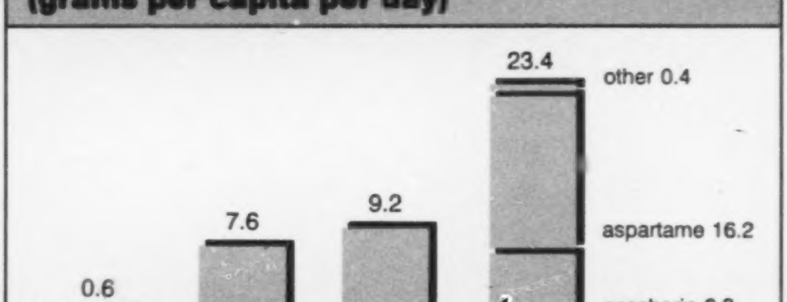
PS-99 and PS-100: Dr. Robert G. Bost, Director, Sweetener Development Program, General Foods Corp., announced the development of two high-intensity sweeteners. About five years ago, GF launched a research program to look at the mechanisms of sweeteners. PS-99 (1,800 times sweeter than sucrose) and PS-100 (2,200 times sweeter than sucrose) are the result of that program.

The preliminary toxicology work on these sweeteners looks promising, Bost said. Future plans involve finding a manufacturing partner and focusing efforts on process development. Approval for PS-99 and PS-100 is expected in four to six years.

Acesulfame-K: Business Development Manager, Hoechst Celanese Corp., Karl H. Gruettemann, spoke about acesulfame-K, which is currently approved in 18 countries. And so far there have been no adverse reports on its safety, Gruettemann reported.

Gruettemann said that he had recently seen a draft regulation allowing the use of acesulfame-K in this country. The manufacturer plans on following up with additional usage petitions requesting the sweetener's use in products such as liquid juice and baked goods. The current cost of acesulfame-K in Europe is $35 to $40 per pound at introductory quantities.

High Intensity & Non-Caloric Sweeteners (sucrose equivalent sweetness) (grams per capita per day)



Source: Public Policy Forecasting, Inc. — Graham T.T. Molitor, 1987

Sweetener (U.S. marketer/developer)	**Description**	**Current legal status**
Aspartame The NutraSweet Co. Skokie, IL	A low-calorie nutritive sweetener which is approximately 180 times sweeter than sucrose. It is a methyl ester of two amino acids – phenylalanine and aspartic acid (aspartate).	FDA approval for limited applications granted in October, 1981. Since than other uses have been approved such as its use in beverages.
Saccharin	A non-caloric sweetener approximately 300 times sweeter than sucrose. It is derived from purified methyl anthranilate.	From 1969 to 1981, saccharin was the only synthetic sweetener approved for use in the U.S. In 1977, FDA proposed prohibiting its use but, as a result of public outcry against the proposed ban, the U.S. Congress declared a moratorium on its ban. It is currently approved for use in more than 80 countries worldwide.
Cyclamate Abbott Laboratories Abbott Park, IL	A non-calorie sweetener, approximately 30 times sweeter than sucrose.	Withdrawn from U.S. market because of FDA ban in 1969. Abbott Labs and CCC filed new petition in 1982. By November 1987 all additional studies requested by FDA were submitted. Permitted for use in 40 countries, including Canada.
Acesulfame-K (ACK) American Hoechst Corp. Somerville, NJ	A high-intensity, non-caloric sweetener which is approximately 200 times sweeter than sucrose.	FDA has been reviewing a petition since 1982. ACK is approved for food use in 17 countries including the U.K., Switzerland, West Germany, and Australia. Endorsed by WHO in 1983 and EEC Scientific Committee for Food in 1985.
Sucralose McNeil Specialty Products Co.	Made from sucrose with three -OH groups replaced with -Cl molecules. It is non-caloric and 600 times sweeter than sucrose.	Food additive petitions submitted in U.S., U.K., and Canada in 1987.
L-Sugars The Lev-O-Cal Co. Rockville, MD	Has different orientation of various atomic groups on carbohydrates – such as fructose – to form mirror images. Has identical chemical and physical characteristics but isn't absorbed by the body.	Long-term testing program for safety and efficiency remains to be done. Expect toxicology testing to be finished in 1990.
Derivatives of Thaumatin INGENE, CA	A natural protein (medium size), 400 times sweeter than sucrose which is produced by fermentation.	Working on Toxicological studies, hope to file food additive petition in 1989.
Alitame Pfizer, Inc. New York, NY	A dipeptide ester consisting of L-aspartic acid and D-alanine. It is approximately 2,000 times sweeter than sucrose.	Filed petition with FDA in August 1986.
PS-99, PS-100 General Foods Corp. White Plains, NY	PS-99 and PS-100 are high intensity sweeteners which are 1,800 and 2,200 times sweeter than sucrose. Developed through computer modeling.	Just beginning toxicological tests, hoping for approval in four to six years.

Acesulfame-K has a high degree of stability both at low pH and when exposed to high heat, according to Gruettemann. He also noted that it has a synergism effect when blended with aspartame.

Sucralose: Franta J. Broulik, Senior Manager, Regulatory Affairs, McNeil Specialty Products Company, explained that sucralose is made from sucrose, with three -OH groups being replaced with three -Cl atoms. It is 600 times sweeter than sucrose.

Food additive petitions for sucralose were submitted in 1987 in the U.S., the U.K., and in Canada. Tate & Lyle Speciality Sweeteners, an English company, will market sucralose in Europe, Africa, Canada, and the Far East. The marketing of sucralose in all other countries will be handled by McNeil Specialty Products, a division of Johnson & Johnson Co.

L-Sugars: Eduardo Squillace, Chairman, Lev-O-Cal Company, described L-Sugars as identical to sucrose or other sugars except they have a different orientation of various atomic groups to form a mirror image. This gives the same chemical and physical characteristics to the sugars they mirror except they are not absorbed by the body.

Currently, the toxicological testing for L-sugars is underway. It is expected to be completed by 1990 and a petition filed by 1991. Research is being supported by Biospherics Lab, Beltsville, MD, and several Italian companies—Eridanioa, Genova, Italy, and Montedison, Milan, Italy.

Derivatives of Thaumatin: Dr. Gary Wilcox, President and CEO, INGENE, told of a new genetically engineered manufacturing process to produce thaumatin by fermentation. Thaumatin, a natural protein which is 400 times sweeter than sucrose, is isolated from an African plant and used as a flavor enhancer in England.

Beatrice, which is sponsoring the research, is now conducting taste tests. Toxicological studies are underway and INGENE hopes to file for approval by 1989.

Alitame: Dr. Leonard Czuba, Director, Safety and Regulatory Affairs, Pfizer, Inc., said that the review process for alitame (Pfizer filed a petition for alitame in August, 1986) is proceeding well, but he was not prepared to say when approval was expected.

Alitame is 2,000 times sweeter than sucrose and exhibits excellent stability, according to Czuba.

"Satisfying the taste for things sweet and bereft of unneeded calories, calorie-controlled sweeteners will account for over 50 percent of all sweetener use beyond the turn of the century," summarized Graham T. Molitor, President, Public Policy Forecasting, Inc. "Consumers, the majority of whom already are obese or overweight, will hasten the disfavor and decline of caloric sweeteners."

MEASURE BIG-PIPE FLOW THE EASY, LOW-COST WAY.

Simply insert Monitek's magnetic flow sensing probe into your pipe. No need to change the piping. No need to stop the flow. Just bore a hole with a 1-inch hot tapping tool and screw in the probe.

It's that simple.

And the cost of the whole system, probe plus indicating unit, is only about half of any alternative.

The system works with any pipe 6 inches in diameter or larger. Accuracy is ±1%. Output is 4 to 20 mA. Readings appear in any units: GPM, GPD, MGD, liters per minute, etc.

For the whole story on the Model 63, contact Monitek, Inc., 1495 Zephyr Ave., Hayward, California 94544. Phone (415) 471-8300.

SEND FOR FLO-PROBE DATA

MONITEK
LIQUID MONITORING SPECIALISTS

Circle 63 on Inquiry Card

THE INVISIBLE LEVEL-MEASURING ROD. WE MAKE IT WORK!

Ultrasonics. The premier theoretical technique for measuring level and open-channel flow. But let's face it: there have been practical problems. We know them. We've faced them. We've solved them.

We have the solution to problems like standpipes. Turbulence. Nearby noise. Obstacles in tank. Granular level. Powder level. To name only a few.

Our sophisticated Series 4000 instruments have problem-solving features like noise suppression, echo enhancement, echo averaging, and coded-pulse ultrasonic signals that can't be mistaken for ambient noise.

CALL US NOW.

Chances are we've solved your problem already. To find out, phone (415) 471-8300, or address Monitek, Inc., 1495 Zephyr Ave., Hayward, CA 94544.

MONITEK
LIQUID MONITORING SPECIALISTS

Circle 101 on Inquiry Card

Ocean Spray Cranberries is a prime example of co-op success: Sales and return to owners have increased for 12 years in a row.

THE CO-OP STRATEGY

LINDA K. FREEMAN
Contributing Editor

The last several years have been difficult ones for U.S. farmers. You need only look at television news, or read the newspaper to know that being a farmer today is more than planting crops or milking cows, it's learning how to survive in an economic environment rife with competition—both here and abroad.

Farmers in a global market

"We are living in a world becoming increasingly more abundant in global supply, without a substantive increase in consumers," says William F. Allewelt, Jr., president, Sun-Diamond Growers of California. "There is more product available for a relatively finite block of consumers," he says.

The way a lot of today's farmers have found to survive in agriculture is by being members of one of more than 5,600 farmer cooperatives. Farmer-owned cooperatives are performing the vital functions today of helping cope with over-capacity, low commodity prices, falling land values, serious credit problems and financial stress.

Co-ops are responding to some of these problems in a manner common to today's industry: mergers, acquisitions, joint ventures, streamlining of operations, staff reductions, elimination of unprofitable product lines, and greater attention to world markets.

"Cooperatives have gone ahead and made the necessary adjustments," says Wayne Boutwell, president of the National Council of Farmer Cooperatives. "They have lowered costs, lowered personnel. They have done well responding to a down situation ... they have positioned themselves well." In fact, says Boutwell, "Proprietary companies could learn from cooperatives."

Co-ops are big business

"We are no different from Nabisco or

COOPERATIVES

The last few years haven't been easy ones for U.S. farmers. The way some have survived and prospered is almost as old as the ag industry itself: Co-ops.

Campbell Soup," said one co-op executive talking about their operations. And that's true, to some extent.

A co-op is a business enterprise formed to achieve certain goals: improving market position, increasing income, and maximizing operating efficiency. In order for a co-op to be successful in achieving those goals, it must be a successfully operated business.

To do that, co-ops operate like other food industry businesses. They are carefully managed and operations are carefully coordinated. Research and development work is done in concert with sales and marketing. Manufacturing operations are coordinated with sales. As with all major industrial operations, communication between departments and areas of operation are vital.

But there are some real differences, both in operation and in attitude.

"In a proprietary company," says John Lawlor, manager of communications at Ocean Spray Cranberries, "if things are down, you simply stop buying raw material. You don't have that option with a co-op, so it forces us to think about businesses which can consume a growing crop over time and put those in place so that we are ready to go when the crop expands. A proprietary company doesn't have that urgency ... they cut back."

A different attitude

Co-ops also differ from proprietary companies in their corporate attitudes. "In a co-op," says Lawlor, "there is a strong sense of ownership and sense of product that you don't get with a proprietary company. It is their family and their livelihood, so it is important to them."

But that can be a curse as well as a plus. It is difficult, especially in a depressed agricultural economy, for some co-op members to see beyond the boundaries of their own fields. They have difficulty looking at the overall operation of the co-op and its long-term goals when they see declining prices and product surpluses.

Diminishing price supports

A perfect example is the situation facing the dairy farmers today. For years there has been over-production of raw milk. Farmers have been helped by price supports through federal legislation. (When more than 5 billion pounds of raw milk is produced, the price support program goes into effect.) Under the current budget reform taking place in Washington, however, it is possible that dairy farmers will lose $1.50 in price supports over a two-year period, bringing the price down to below $9.00 per 100 pounds of fluid milk. That money, says Irwin Elkin, president of the Associated Milk Producers, "comes off the farmer's income."

It is easy in good times for co-op owner-members to support expansion or modernization programs, increases in advertising budgets, and capital expenditures. But when faced with a cut in income, it makes it difficult for the farmer to support such actions. This can carry over to lack of support for some of the projects and programs the co-op's management team wants to enact – programs and capital expenditures must be approved by the Board of Directors comprised of owner-members.

One co-op executive described co-op approval channels as "slower and more tedious than private business," and there is definitely a tendency for regional problems to directly affect the decision-making process at the board level. Different regions sometimes have different philosophies and different problems facing them. Resolving these conflicts, while doing what is best for the co-op, is not an easy task, and at times not one quickly accomplished.

The supply co-operative

Land O'Lakes, Inc., Minneapolis, MN, with 600,000 farmer-members (mostly grain and livestock), is a unique representative of how a co-op functions. Land O'Lakes is an ag-supply co-op as well as providing food processing and marketing functions for its member-users.

The farmer-members belong to 1,500 local cooperatives which supply them with a wide variety of agricultural inputs and services.

In addition, there are 10,000 voting units (dairy and turkey farmers, direct owners of the co-op, whose products feed the processing operations of the co-op). The 1,500 locals and the voting units are divided into 18 districts, each of which sends two members to the Board of Directors. The Board selects the President of the organization to run the day-to-day operations, while the Board formulates the policies by which the co-op functions making "each farmer-member an owner," says Terry Nagle, Land O'Lakes' director of communications.

In 1986 Land O'Lakes reaped total sales of $2.2 billion from ag-supply and food processing. More than 600 different food items are sold to consumer, foodservice and industrial markets across the country. An international division markets products in more than 20 countries.

Consolidation is key

How is Land O'Lakes staying competitive with an acknowledged over-supply of milk? "We are in a consolidating mode," says Nagle, "to reduce costs and market more effectively." Indicative of this are two joint ventures, one with CENEX to consolidate ag service operations and another with Mid-America Dairymen, which is a limited milk processing and whey marketing venture.

The joint venture with CENEX has proven a stroke of genius. Says Ralph Hofstadt, president of Land O'Lakes: "We thought we would save $10 million—and it will be $11 million actually. We are saving $5-6 million in administrative costs. By the end of 1989 we could put $20 million on the bottom line."

Aggressive management

Ocean Spray Cranberries, Inc., Plymouth, MA, is another highly successful co-op. The key, says Jim Kirk, business operations manager, is that the co-op is aggressively managed and operated.

"This is what distinguishes Ocean Spray from other companies," says Kirk. "We have a very good balance between the ability to aggressively support an existing business, while at the same time actively pursuing new products." Proprietary companies, he says, "forget what keeps the lights burning."

The aggressive management style has paid off. For 12 years in a row they have increased sales and also the profits returned to the growers. "We expect to be a billion dollar company by 1990 and to continue to grow beyond that," says Kirk. In 1987 sales were $730 million, up from $636 million in 1986.

Ocean Spray was the first U.S. processor to market an aseptically packaged juice drink. The "Paper Bottle" line today is comprised of nine juices and juice drinks and represents sales of $35 million. Only Coca Cola Foods and General Foods top Ocean Spray in brand name juice drinks; only *Minute Maid* and *Tropicana* sell more volume.

A co-op for co-ops

Sun-Diamond Growers of California in Stockton is a co-op in operation for other co-ops. It markets and processes the crops of 5,000 direct owner-members of five commodity-based co-ops. A Fortune 500 company, in 1986 Sun-Diamond's five aggregate organizations grossed $500 million in sales.

Included in this umbrella organization are: Diamond Walnut Growers, Inc., (walnuts); Sun-Maid Growers of California, (raisins); Valley Fig Growers, (figs); *Sun-Maid* and *Sunsweet* dried fruits; and *Sunsweet* prunes.

William F. Allewelt, Jr., president of Sun-Diamond, feels a primary plus is the brand identification that the co-op's members enjoy. This gives them strength in world markets they couldn't achieve otherwise.

Another plus: "There is no primary tax on the corporate activity," of a co-op, says Allewelt, "like there is on the for-profit companies because profits go back in proportionate shares to the owner-members."

There are some disadvantages, however, the primary being, according to Allewelt, that "whereas the conventional publicly-owned company has a mission to operate for an acceptable return on capital to its investors, the prime idea for a cooperative is to perform a service for its members. From time to time the issue of performing the service versus operating for optimum profitability may be in conflict." And sometimes

Ocean Spray scored a first in 1981 by being the first in the U.S. to add the aseptically packaged "paper bottle" to its juice line. Today, sales of that line are $35 million.

By consolidating hauling routes the Morning Glory Region of AMPI expects to save $3 million in hauling costs.

At Sunkist, citrus is run through a computerized electronic sizer prior to packing for shipment. The co-ops trademark is known throughout the world and is considered their most valuable asset.

growers tend to look at a situation from the perspective of how it will affect them as an individual, rather than how it will affect the co-op as a whole.

O-At-Ka performs a vital balancing function for three owner-cooperatives. Taking fluid supplies from the three dairy co-ops, they process their own line of dairy products.

Hard times for dairies

One area of agriculture where co-ops have definitely been able to make a difference is to the dairy farmers of the U.S. Seventy-five percent of the milk produced in the U.S. is marketed through cooperatives.

Associated Milk Producers, Inc. (AMPI), headquartered in San Antonio, TX, represents 25,000 member farms in 21 states across the midwest, south and southwest who produce about 12 percent of the U.S. milk supply. AMPI's vast operations are divided into three separate regions each operating autonomously.

At AMPI company management feels that "consolidation of resources ultimately is the key to survival – survival of the family dairy farm and survival of a strong cooperative system that provides needed support functions."

The Morning Glory Region is a one-year old merger of AMPI's Mid-States Region and Morning Glory Farms Cooperative, a 2,000 member co-op in Wisconsin. One of the most significant aspects of the merger, says Ken McKenzie of Morning Glory, was the consolidation of milk hauling routes. "Now," he says, "instead of trucks criss-crossing each day they are more efficiently routed" and there are fewer trucks on the road. It was estimated that $3 million could be saved in merging the hauling functions.

Membership in AMPI makes available such corporate America-type services as self-funded group health care trusts, and disaster benefits. "Sometimes the price we pay for the milk is not as competitive as they could get elsewhere," says McKenzie, "but they stay in the co-op to get the health plan."

Even with its leadership position in size, sales (expected to be $2.7 in 1987), and production (17 billion pounds of milk each year), AMPI is not immune to the problems facing dairy farmers. Three more price support cuts are expected by January 1989, each in the amount of 50 cents. Every time the price support is cut, dairy farmers strive to produce more to make up for the financial shortfall. This only complicates the oversupply problem. It's a difficult, seemingly ceaseless cycle.

"There are only two ways of dealing with over-abundance," says Irwin Elkin, president of AMPI, "and they are cutting price and orderly supply management." Supply management is a concept that is ever-so-slowly gaining acceptance. This would coordinate dairy product supplies nationwide to avoid large oversupplies and to balance supply more efficiently with demand. It has been shown, says Elkin, that price alone will not solve the problem. "We need something in place on a standby supply mechanism...when the problem is there, it works. When the problem isn't there, it goes away."

Right now, however, the "various parts of the country can't agree," he says. "But," cautions Jim McKenzie, "we are all in the same market."

A co-op-owned co-op

O-At-Ka, a Batavia, NY co-op, performs a balancing function for three dairy co-ops – Upstate Milk, Dairylea and Niagara Cooperatives – all involved in bottling and dairy processing.

O-At-Ka's primary function is to provide a place and use for milk not being used by the three member co-ops in their bottling or processing operations. By accepting excess fluid supplies, O-At-Ka can perform its second function: production and marketing of dairy products.

Riceland's international marketing has added substantially to their profitability. Here a ship is loaded with whole grain for export.

TOP 50 AGRICULTURAL COOPERATIVES – 1986

RANK	COOPERATIVE	TOTAL SALES	NET MARGINS
1	Agway, Inc.	$3,510,506,000	13,978,000
2	Farmland Industries, Inc.	2,700,000,000	(152,200,000)
3	Associated Milk Producers	2,535,873,000	3,703,000
4	Land O'Lakes, Inc.	2,215,123,000	10,542,000
5	Harvest States Cooperatives	1,837,081,075	4,838,496
6	Gold Kist Inc.	1,432,997,000	*
7	Mid-America Dairymen, Inc.	1,420,321,000	8,015,000
8	CENEX	1,093,180,940	(12,060,926)
9	Dairymen, Inc.	987,039,000	8,660,000
10	Indiana Farm Bureau Co-op	892,453,000	1,765,000
11	Countrymark, Inc.	834,278,023	557,650
12	Sunkist Growers, Inc.	831,320,000	*
13	Milk Marketing, Inc.	816,384,000	265,670
14	GROWMARK, Inc.	781,407,000	11,836,000
15	CF Industries, Inc.	766,139,000	(42,778,000)
16	National Cooperative Refinery	715,874,418	(42,685,832)
17	Southern States Cooperatives	645,694,101	13,043,805
18	Tri/Valley Growers	644,000,000	(1,300,000)
19	Ocean Spray Cranberries, Inc.	635,758,000	*
20	Ag Processing, Inc.	625,404,000	2,016,000
21	Northwest Dairymen's Assn.	615,357,000	17,712,189
22	Calcot, Ltd.	569,847,364	*
23	Union Equity Cooperative Exch.	568,425,840	14,001,335
24	Riceland Foods, Inc.	532,300,000	*
25	California & Hawaiian Sugar	526,255,000	*
26	Sun-Diamond Growers of CA	498,360,000	*
27	Wisconsin Dairies Cooperative	461,778,000	7,726,000
28	Western Dairymen Cooperative	446,744,804	(2,182,600)
29	Michigan Milk Producers Assn.	432,235,000	2,610,000
30	CA Almond Growers Exchange	418,347,000	567,746
31	MFA, Inc.	398,456,206	2,298,000
32	Prairie Farm Dairy, Inc.	391,000,000	15,247,300
33	Agri-Mark, Inc.	381,007,345	5,298,994
34	American Crystal Sugar Co.	354,397,000	*
35	Dairylea Cooperative, Inc.	342,162,898	*
36	Eastern Milk Producers	309,212,677	232,943
37	Citrus World, Inc.	285,387,000	*
38	Maryland & Virginia Milk Producers Cooperative Assn.	280,412,000	4,546,551
39	National Grape Co-op Assn.	269,082,000	*
40	Tennessee Farmers Cooperative	240,000,000	5,900,000
41	Norbest, Inc.	232,041,939	*
42	Universal Cooperatives, Inc.	228,827,000	1,906,000
43	Mississippi Chemical Corp.	226,270,000	(12,570,000)
44	Swiss Valley Farms Co.	216,571,152	1,825,287
45	Upstate Milk Cooperatives	216,000,000	7,800,000
46	Tree Top, Inc.	192,408,000	1,658,000
47	MFA Oil Company	186,333,000	5,789,000
48	Knouse Foods Cooperative, Inc.	160,000,000	3,400,000
49	MFC Services	159,982,166	(4,621,333)
50	NORPAC Foods, Inc.	146,853,649	1,181,136

*Marketing cooperatives operating on a pool basis. Earning figures comparable to the other cooperatives are not available.

Source: National Cooperative Business Association, "Cooperative Business Journal," Oct. 1987, page 11.

In 1986 the co-op had sales of $135 million; in 1987 they expect sales of $87 million, reflecting a 26 percent decrease in raw milk supply from their three members. Why? "We are limited on raw ingredients and when there is heavier demand by the cheese industry, which there has been, it affects the amount of milk coming into our co-op," says Jim Westwick, marketing manager.

Yet, O-At-Ka provides a vital function: balancing the raw fluid supplies of three other co-ops so the best and most profitable use can be made of available product. This has allowed the three parent-co-ops to be stronger, and thereby made the farmer-owners of those co-ops stronger.

International marketing

Sunkist Growers, Sherman Oaks, CA, is a marketing co-op representing nearly 6,000 growers of citrus fruit throughout California and Arizona.

The major portion of their business is in fresh fruit, which accounts for 75 percent of their gross revenue ($825 million for fiscal year 1987). Close to 75 million 40 pound containers of citrus were sold. The remaining 25 percent, or about 650,000 tons, was processed into various products. In all, 400 different products are sold in 40 different countries under the Sunkist name.

Kurt Anderson, vice president, public relations and grower relations, says "our cooperative is strong because we have a good trademark, are well capitalized and have a good sales network."

International sales are important to their operation. In 1986 alone, Sunkist accounted for 65 percent of the total oranges shipped to Japan under an agreement between the industry, the U.S. government and Japan. Strong returns have been realized in Hong Kong, Singapore, New Zealand, Australia and Malaysia.

Grower-driven organization

"We are a grower-driven organization working to find better markets" for the members of the California Almond Growers Exchange (CAGE), says Steven Easter, vice president, member and government relations. This 5,300-member co-op in Sacramento, CA, markets under the name *Blue Diamond*, easily recognizable in its effective advertising campaign featuring actual grower-members.

"Together our grower-members have strength," says Easter. With the co-op "they have someone to look after the marketing on their behalf that has their interests and *only* their interests at heart. There is no motive to make a profit other than for the grower."

CAGE is considered by many in the agricultural field to be one of the most skillful marketers in the industry. Proof: Today almond consumption has grown to in excess of 750 million shelled pounds, up from 450 million just five years ago. Deliveries to domestic customers were up for the fifth year in a row, reflecting an increase in domestic consumption of nearly 58 percent in the last five years. Net sales for the fiscal year were $425

FARMER COOPERATIVE NUMBERS AND MEMBERSHIPS, 1986

Component	Cooperatives	Memberships
	Number	
Products marketed:		
Cotton	396	94,749
Dairy	345	152,881
Fruits & vegetables	344	61,880
Grain and soybeans	1,514	909,643
Livestock, wool & poultry	469	450,120
Rice	49	20,600
Sugar products	40	8,020
Other (beans, peas, nuts, tobacco & miscellaneous)	103	315,031
Total farm products	3,260	2,012,924
Total farm supplies	1,971	2,225,550
Total services	138	163,283
TOTAL	5,369	4,401,757

Note: Information is preliminary. Many cooperatives are multiproduct and multifunctional in operations and are classified according to predominant commodity or function indicated by business volume.

Source: "Farmer Cooperatives," October, 1987, page 6, published by the Agricultural Cooperative Service, U.S. Department of Agriculture.

million, up from $347.5 in 1985. More than half of the sales are to foreign countries.

Growth has come through finding new uses and new markets. *Blue Diamond* almonds are used in more than 2,000 different ways and sold in 88 foreign countries.

The world's largest

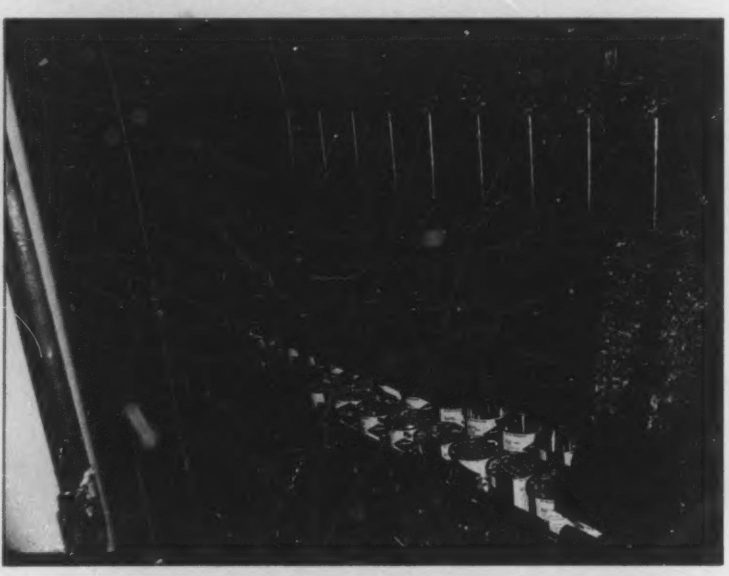
The Tree Top cooperative in Selah, WA, world's largest apple processing company, had retail sales of $187 million last year. Total sales by the company accounted for one-sixth of the state's $3 billion ag industry.

The crops of the more than 3,800 grower-members are processed in one of the co-ops four processing plants into a wide range of juice products, concentrates, frozen, and dried products.

John McAlister, director, public affairs, credits the success of the co-op to responsive and aggressive marketing.

But being a co-op, says McAlister and many of his co-op counterparts, "is a mixed blessing." When times are good, everything is fine. But "there is always a shortage of capital for future expansion. If we want to develop new products or build a new plant we are very limited to the amount of capital resources we can extract from the co-op," he says.

At Sun-Diamond's cannery operation, shelled walnuts are routed to cans where they are automatically filled.



Building consumption

Riceland Foods, Inc., Stuttgart, AR, a co-op of 11,500 farmer members in Arkansas and nearby states, is the largest miller of rice in the U.S., the nation's fifth largest grain storage company and a Fortune 500 company. "Each year," says Bill Reed, vice president, corporate development, "we mill and market approximately one-half of the Arkansas rice crop, which figures to be about 20 percent of the U.S. rice crop."

They have been leaders in what they do best: marketing rice. Per capita consumption of rice is now 17.4 pounds, up from 9.1 in 1975. By finding international markets and working with federal programs, the co-op has been able to work off their surplus. U.S. rice is now sold into roughly 75 different countries by Riceland.

Riceland also has an edible oil operation producing a wide range of soybean oil products and the co-op is one of only two manufacturers of oil-free lecithin in the U.S. Riceland products are marketed under the *Riceland* and *Chefway* names.

Looking to the future

Despite the difficulties of recent years, there is optimism heading into the 1990s. Says Ralph Hofstadt, president of Land O'Lakes, "I'm very optimistic, but only if this group of organizations can clearly see the kind of business environment they will be operating in. It will be volatile, but very exciting. We have to develop new programs and change present structures."

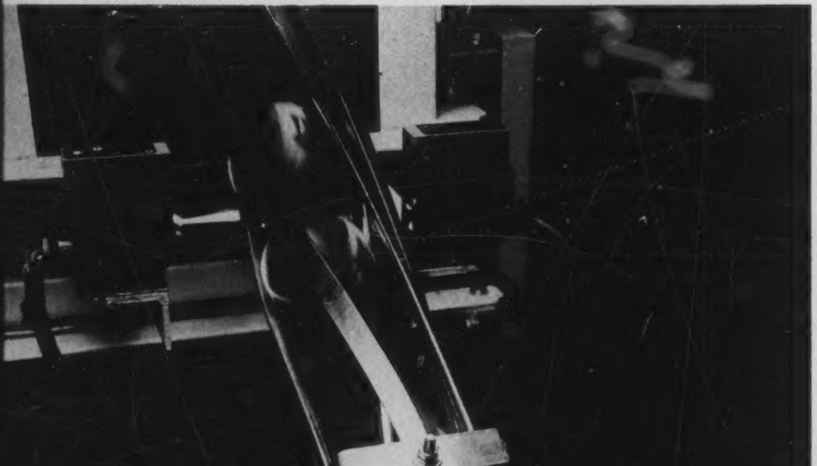
What the co-ops have to look forward to is continued merger, acquisition and joint venture activity. They must continue to market aggressively, both internationally and domestically. The battle for share of market will continue to be waged around the globe.

Special Emphasis

CANNING MACHINERY

CANNING INDUSTRY: METAL VS. PLASTIC

Closing and inspection systems offer speed, efficiency, and product integrity to the traditional can line. But the metal can line may be affected by a new force in packaging design: plastic cans.



Photoelectric sensors from Omron Electronics monitor operations on a high-speed canning line. The sensors are able to detect jams on the line.

Canned foods and the canning industry have been around for so long that they are often taken for granted. In 1810, Nicholas Appert, a Frenchman, published the first book on canning methods and introduced a new form of food preservation. As a result, canned foods were most likely the first convenience foods.

While the advent of plastics and plastic cans is beginning to mean additional competition, the metal can still has continued to maintain a strong position in the food industry, most notably in beverages.

Recent trends in fact indicate that metal can manufacturers can expect significant growth over the next decade. The amount of can sales to major end-group users, (excluding pet foods), according to the Can Manufacturers Institute, Washington, DC, shows that 23.4 billion units of cans were sold in 1986. In the beer and soft drink category, 72.9 billion cans were shipped to manufacturers in 1986.

The most recent estimates for 1987, according to the U.S. Industrial Outlook of the U.S. Department of Commerce, show that 27.2 billion units of metal cans were shipped to major end-group users. And, in the beer and soft drink area, 78 billion units were shipped to manufacturers during the same time period.

Canning equipment

Because the canning industry is always looking to improve processing methods and to enhance product quality, safety and efficiency, canning and seaming equipment and the inspection systems to accompany them have reached an extremely high level of speed and accuracy.

For example, Continental Container Systems, a division of Continental Can Compa-

MARGIE J. RUSSELL
Senior Associate Editor

ny, Inc., West Chicago, IL, has several lines of closing machines, the most versatile being the *2000 Series*, three basic units which can accommodate a wide range of packaging. The *2003 RCM1* three-spindle machine will close 401 through 610 diameter cans at speeds up to 300 cpm. The *2004 RCM1* four-spindle machine closes 202 through 408 diameter cans at 400 cpm. And the six-spindle *2006 RCM1*, will do 202 through 404 diameter cans at 600 cpm.

The 2000 series is designed for height changeovers that can be done in several minutes, because of a new design that provides for the support and driving of all height-change-related components directly from the machine's upper housing. This eliminates the need for sliding shaft and key fits.

Another major supplier of seaming equipment, Angelus Sanitary Can Machine Company, Los Angeles, CA, has a straight-line feed seamer, *model 61H*, that provides high-speed operation with semi-automatic lubrication to minimize downtime and maintenance costs. Cans are seamed at high speed in a six-spindle "can spin" turret. Each spindle has durable, large-diameter first and second operation seaming rolls mounted on tapered roll bearings. Seaming rolls can be individually adjusted for height and seam thickness.

A closing machine which meets the industry's needs for speed, reduced spillage and low maintenance costs has been introduced by FMC, Madera, CA, as the *FMC 952*. This model is a sixteen-spindle closer using can rotating seaming principles which means that it runs faster but at the same time, provides gentler handling of lightweight cans because of lower seaming. The 952 reduces spillage through effective can spacing of the closer infeed chain and seaming head. This allows ideal synchronization to all of the fillers and minimizes can acceleration. The machine, used mainly for beverage, closes up to 2000 cpm.

Hema International, Sandy, UT, has a vacuum seamer, *model SHV60*, which is designed for round and odd-shape containers. This is an automatic seamer which can be adapted to a particular application. The seaming head allows first and second seaming operations, and is mounted on a heavy duty, articulated arm, allowing the head to swing out of the main frame. Adjustments and changeovers are easy. The SHV60 runs at speeds of 15 to 120 cpm depending on the size of the container. In addition, Hema is developing a new model which will allow speeds up to 200 cpm, and will also greatly facilitate adjustments and changeovers.

Inspection systems

Even though it is usually fast and efficient, a canning operation is only as good as its monitoring system. The canning operation's accuracy depends on two main factors: that seaming equipment is operating correctly and inspection/detection systems for poor vacuum, incomplete fills and defective cans are operational.

The integrity of double seams is of vital importance in the canning process. With the speed and complexity of current equipment, visual inspection of random samples from the line is no longer acceptable to maintain a high quality product.

For this reason, new technologies have been developed for inspection on the line, one of which is Continental Can's *In-Line Double Seam Tightness Monitor*. The In-Line Monitor allows 100 percent monitoring of double seam tightness for every can before it leaves the closing machine with no effect on speed. An acceptable pressure range curve between the rolls and the chuck is selected, and the monitor matches the image of the actual pressure curve around the seam against the parameters in the software. The system alerts the operator of out-of-limits conditions through a status printer and monitor warning system. The removal

Major markets for metal food and beverage cans (Millions of dollars)

Year	Manufacturers' Sales of Metal cans	Annual Percent Change	Soft drinks, beer	Fruits, Vegetables, Juices	All other foods
1984	$11,621.4	10.1	7,640.6	1,743.7	2,128.4
1985E	12,667.1	9.0	8,463.5	1,975.6	2,228.0
1986E	13,304.6	5.0	8,810.0	2,090.2	2,404.4
1995P	25,120.0	7.0*	17,079.4	3,639.4	4,401.2

*Compounded Annual Average E – Estimate by BTA P – Projection by BTA

Source: U.S Department of Commerce; Business Trade Analysts of questionable containers is accomplished by one of two optional integrated reject mechanisms.

The Double Seam Monitor is available as an option on new Continental Can rotary closing machines. It is also available as a retrofit for the existing 2000 Series.

Along the same lines, Dun-Rite Products, Barrington, IL, offers its *Double Seam Monitor System (DSM)*, which performs single or double can end sampling anywhere within the can line system. As a can is transferred onto the DSM system, it is stabilized, metered and positioned through the sensing zone. The can is rotated three times in front of the sensing bar assembly and the double seam is sampled for defects. If the double seam qualifies, the can remains on the line. If it does not qualify, the can is ejected from the line for inspection.

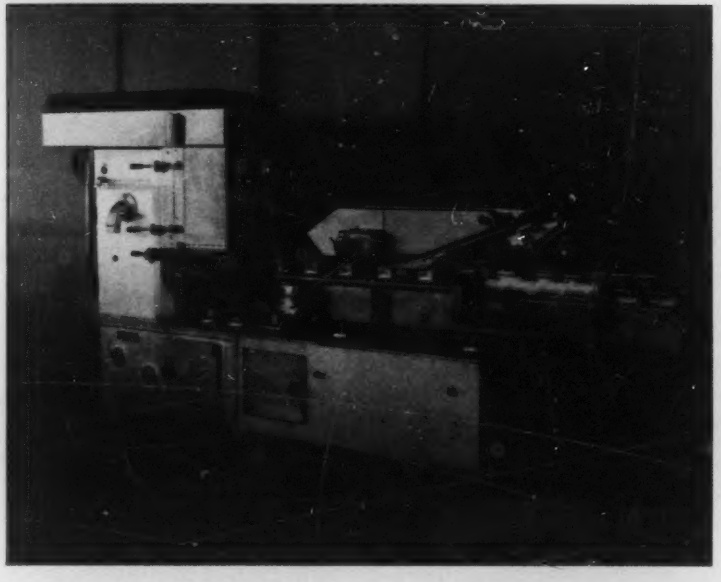
The DSM system can be incorporated into existing can lines for sampling of one or both double seams. The monitor system can sample up to 350 cpm. A built-in controller maintains proper can traffic on the line and Dun-Rite advises that cans should not idle on the DSM system.

Another form of on-line monitoring is vacuum inspection, which uses sensors to detect containers with poor vacuums. When a metal surface is stressed by vacuum, it is drawn into a concave shape. Greater vacuums will create greater degrees of concavity. These systems reject containers when the vacuum is insufficient to pull the can end inward beyond a threshold value locked in a sensing panel.

Key Technology, Walla Walla, WA, offers the *1200 Series of Dud Detectors*, which tests both ends of a can concurrently. Sensors located under the belt and in the top reference assembly measure can lid deflection and compare the readings to adjustable set points. Low vacuum cans and leakers are removed from the line at up to 1200 cpm.

Peco-Controls, Milpitas, CA, offers its *VAC-TRAC* dud-ejector system which checks each container for end-deflection by a three-point proximity sensing method. Each container passes under the sensor head, where outer sensors measure and average reference depth at the container's outermost edge. A middle sensor measures depth at the center on the container's end. Container end deflection is determined by subtracting the center-end measurement from the average signals on the outermost edge. The system has the capability to scan at 750 cpm.

An inspection system which is used on dedicated can lines from 202 size or greater is available from TapTone Container Inspection Systems, a division of Benthos, Inc., North Falmouth, MA. The *Standard Vacuum Profiler* uses a sensor to define a can end and can scan up to 1200 cpm. As a container passes under the sensor, a measurement is made defining the shape, or profile, of the container end and sensor output will vary according to the shape of the surface.



This vacuum seamer, model SHV 60, from Hema International, operates according to the double seam principle and can accommodate a wide range of containers.

In the case of a can end, the Profiler measures and responds to the degree of curvature of the end, which is electronically measured and compared with a preset "good" and "bad" profile. The system has a circuit concept which electronically stores these profiles. Assuming the production process is controlled, the curvature should remain consistent. If vacuum is lost, the curvature or the profile changes. A proportional readout indicates the degree of vacuum. The Profiler senses this profile change, and rejects the container with the defective profile.

Specialized systems

Inspection, however, is not just a matter of safety, and that is where a photoelectric sensor system, like that available from Omron Electronics, Schaumburg, IL, is ideal to check for proper can orientation. Omron's sensing system consists of a pulse-modulated infrared LED and special reflector and aspheric lenses. When used with a programmable controller, these sensors, the Omron *E3S-R* and *S3D8*, and the controller are able to detect upstream and downstream jams on the line. When the sensor detects the presence of cans, the PC uses internal timers to check if cans are not moving past the sensor at regular intervals (upstream jam) or are sitting still on the line (downstream jam).

The Angelus seamer, model 61H, provides high speed operation with semi-automatic lubrication to minimize downtime and maintenance costs.

The system will then reject or re-route the appropriate containers.

A new trend?

Are plastic cans the wave of the future in the canning industry? They may be, because, plastics have entered the canning marketplace bringing with them great capabilities.

Products packed in plastic containers are lighter in weight than their metal counterparts and are easily stored. They are microwaveable, which right now is a large plus. Presently, plastic containers are more expensive than metal cans but there is evidence that the cost gap is closing. It is believed, however, that small processors cannot afford a changeover to plastics until the price of the containers becomes at least comparable to metal.

The "Omni", for example, is a rigid plastic can developed by American National Can Company, Greenwich, CT. Composed of polyolefin, it is white, with one metal end where the seaming operation occurs. The container is retortable and has a high oxygen barrier, giving the packaged product a long shelf life. Probably the best consumer advantage of the container is that it is microwaveable. The container cannot be recycled but can be fully incinerated, giving off no harmful by-products.

According to American National Can, the Omni container can be used on any existing seaming equipment with some slight modifications. Currently, Hormel Co. is the only processor that is using the Omni can for its meat-based products. In addition, American National Can will be marketing several more Omni can applications in the first quarter of 1988. The containers will be both cylindrical and bowl-shaped.

The newest entry into the plastic can market, the Petainer, was developed by the Petainer Development Company, Atlanta, GA. It is currently being used for beverages in several test markets.

The Petainer can has a standard aluminum lid, is of low barrier layer construction, and has a PVC label. The container has a 15-16 week shelf life but cannot be used in a retort system. The Coca Cola Company had, until recently, test marketed the Petainer exclusively. Original New York Seltzer has since picked up on the use of the Petainer and has launched five of its ten flavored drinks in several test markets, two of which are Detroit and Boston. The container can be run on standard seaming equipment.

However, what if both ends of the can are plastic? We talked to Akerlund and Rausing, of Lund, Sweden, which has introduced its form of the plastic container into the Swedish market under the trade name *Letpak*.

Letpak is a three-piece container in which the can's case, lid and base are composed of polypropylene with a thin barrier lamination of aluminum. One end is sealed to the body by the manufacturer, the other is sealed at the point of fill. Inductive high-frequency welding gives the container a perfect seal.

According to Akerlund and Rausing, the container can be run on standard canning equipment with the addition of a special Letpak sealer. If magnetic conveyors are used on the line, they too must be changed. The line can run up to 200 cpm.

Presently three fruit products packed in the container have been test marketed in Sweden. Letpak has been developed for the worldwide market and will be widely available by 1990.

Here to stay

Most packaging authorities and forecasters will agree that the plastic can is here to stay. The advent of the plastics industry has forever changed the scope of packaging. It is interesting to note, though, the metal institutional can, number ten, has been untouched by the plastics market.

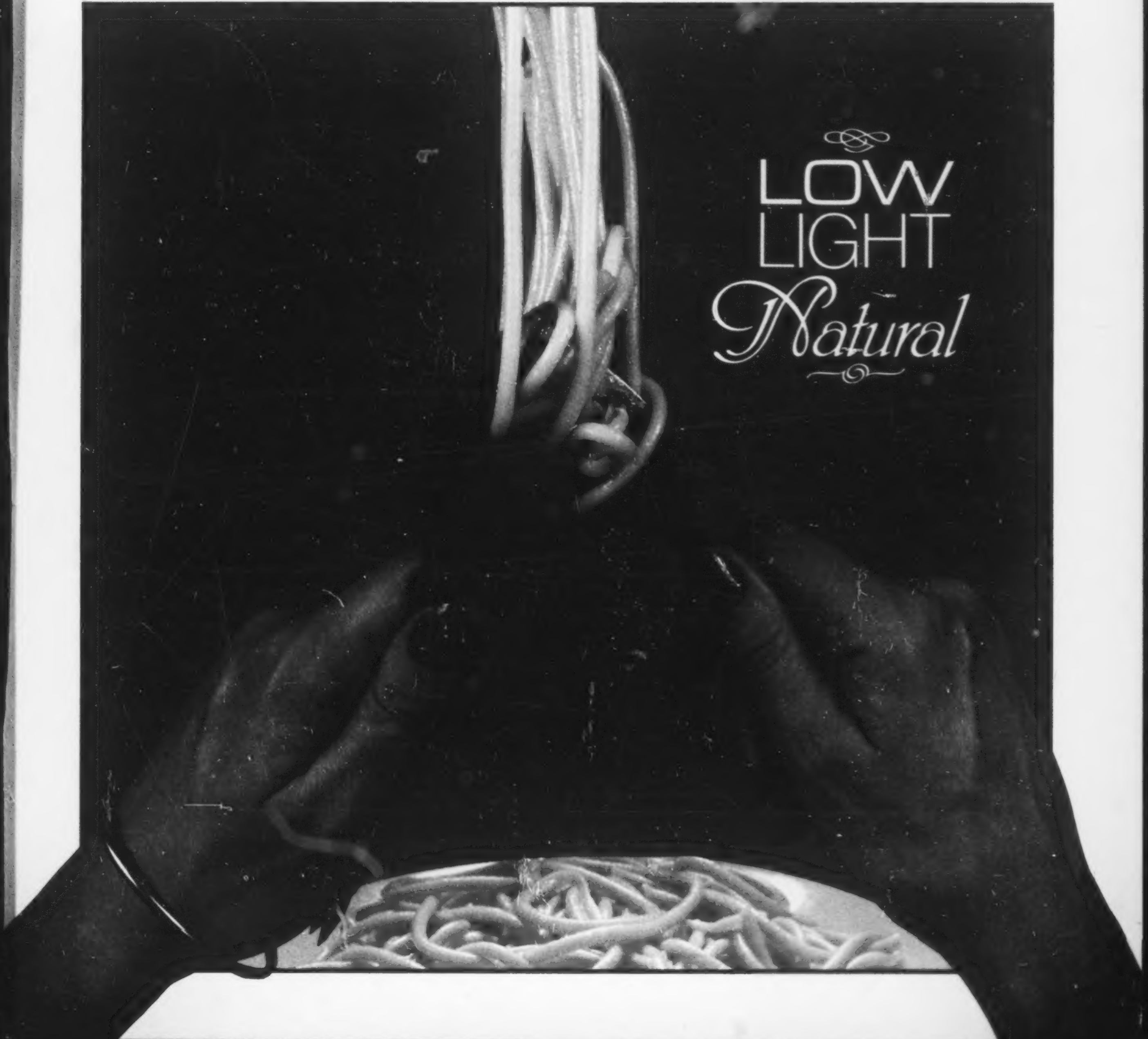
The plastic container is seen as a viable alternative to the metal can. However, this does not mean the end of metal cans—or the machinery to seam them. This machinery is adaptable, and with modifications, can seam metal-end plastic cans and all-plastic cans. It appears that conventional seaming equipment will not go obsolete—as long as a container has an end to be seamed.

CHILTON'S FEBRUARY 1988

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

C2150-6
3/2/88



LOW
LIGHT
Natural

FOOD
ENGINEERING

COVER STORY

The American consumer wants it all – convenience with little or no cooking and cleanup combined with nutritional balance, low calories, high quality and good taste.

Pages 53 to 60

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) February 1988, Vol. 60, No. 2. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ™Chilton Company, 1988. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

12 Industry Report

This month's Report talks about the winners of the 1987 Du Pont Awards competition for food industry innovation, sponsored by the company's packaging division; the Commerce Department's projection of a 2 percent rise in food-industry shipments for 1988; the U.N. Expert Committee's reaffirmation of MSG's safety; and the FDA's plan to make food issues a priority in 1988.

Departments

9 Editorial
10 Calendar
12 Industry Report
23 Marketplace
29 Ingredients
87 New In Print
105 People

Yoplait
Breakfast
Custard Style
150

LOW FAT: PAGE 23

Food Packaging

36 CA/MAP

Controlled/modified atmosphere packaging is an established method in western Europe for increasing product shelf life.

39 Permeable Films

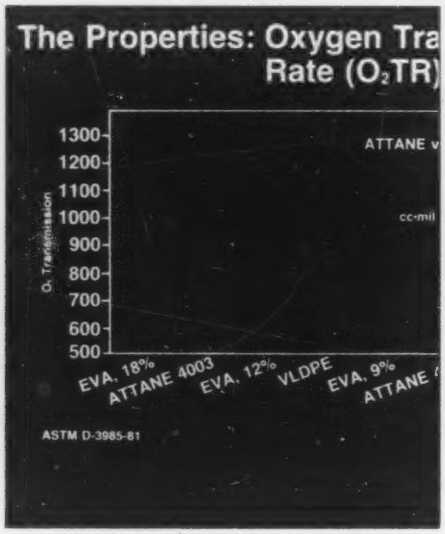
The use of permeable films can compensate for respiration rates of fruits and vegetables, allowing shelf life extension.

44 ULDPE

Ultra Low Density Polyethylene shows commercially-useful properties that can be of practical value in food packaging.

43 Adhesives

Food packages destined for the microwave oven must incorporate stronger adhesives to achieve successful results.

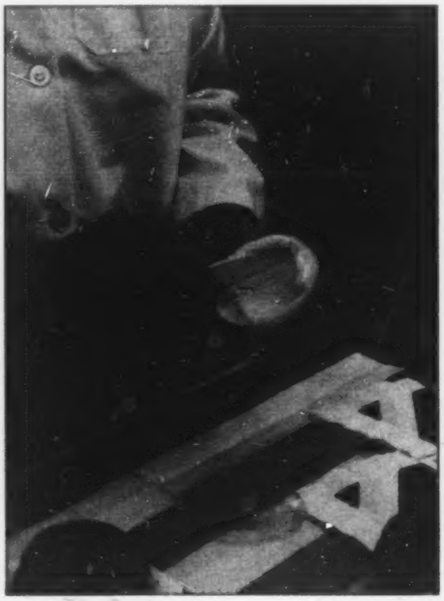


COPOLYMERS: PAGE 44

Features

53 Low, Light & Natural
Cholesterol-free dairy products. Lean pork with fat that's good for you. Fresh beef cuts only 4-6% fat. Chicken surimi. Non-nutritive fats. New technology opens new vistas for the 21st century.

63 Oils and Emulsifiers
Shifts in the market caused by new foreign contenders, advances in technology, and the controversial cholesterol war continue to stir up the oils and emulsifiers industry.



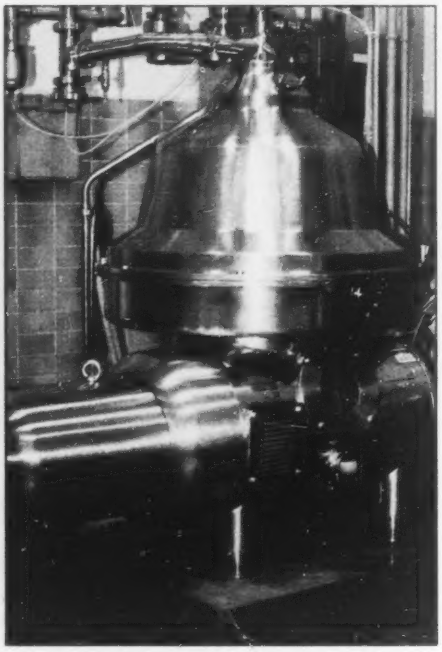
LIGHT BUTTER: PAGE 53

From the Field

71 Separators are a vital part of dairy plant production
77 Immobilized yeast process converts whey permeate to ethanol
80 Broken bag detector is accurate monitor for milk processor
82 New automation process modernizes 200-year-old brewery
85 Automated system in warehouses results in energy savings
86 Printing method reduces cost of inventory and price lists.

New Equipment

88 Processing Equipment
95 Sanitation & Maintenance
102 Handling & Distribution



FLUID MILK SEPARATOR: PAGE 71

Special Emphasis

IMPORTS MAY SHIFT OIL, EMULSIFIER MARKET

Health concerns and technological breakthroughs coupled with increasing foreign imports stir up the industry.

Pages 63 to 68

IMPORTS MAY SHIFT THE MARKET

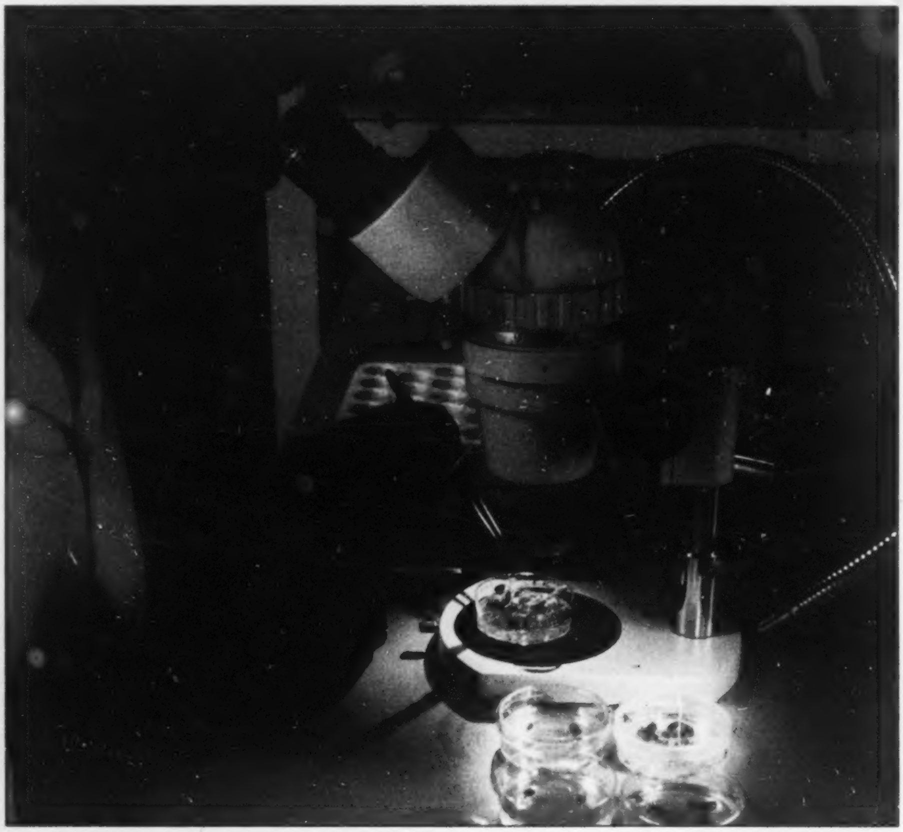
Shifts in the market caused by new foreign contenders, advances in technology, and the controversial cholesterol war continue to stir up the oils and emulsifiers industry.

JOYCE FASSL
Managing Editor

Health concerns, technological breakthroughs in oil extraction processes and biotechnology coupled with a market influenced by increased foreign production is changing the oils and emulsifiers industry.

For example, while domestically produced soybean oil continues to dominate the market, competition is expected to increase from rapeseed oil (which will most likely grow in importance over the next decade) and the "tropical" oils – coconut, palm and palm kernel.

With the US trade embargo on domestically grown soybeans in the early '70s, South American countries such as Brazil, Argentina and Paraguay jumped on the bandwagon and began to market their soybeans to the world. At the same time Malaysia began to increase its production of palm oil, and between 1984 and 1986, the US tripled the amount of the palm oil it imported, according to Business Trend Analysts, Commack NY. Then palm oil prices fell below those of soybean oil, and the competitive race was on.



Advanced biotechnology techniques are changing the oil industry. Shown here is the isolation of sunflower shoots in culture. Photo courtesy Sungene Technologies, San Jose, CA.

Supply of Edible Fats and Oils

	(in million of pounds)			
Supply[1]	1978	1981	1983	1986
Soybean	12,052	12,715	12,133	12,810
Cottonseed	1,367	1,631	885	1,175
Edible Tallow	963	1,137	1,396	1,684
Lard	1,107	1,093	999	899
Corn	810	948	1,142	1,432
Sunflower	261	328	544	551
Peanut	188	191	152	223
Coconut	1,113	1,164	1,061	1,346
Palm	351	276	482	801

[1] Supply equals stocks plus imports plus production for the year beginning October 1.

Source: U.S. Department of Agriculture; and Business Trends Analysts, Commack, NY

The supply of palm oil has more than doubled since 1978.

The approval of rapeseed oil (or canola oil, an export of Canada) by the FDA in 1985 also caused a shift in the market. Rapeseed oil can be substituted for soybean oil in most food products, including margarine, mayonnaise, salad dressing and shortening. Rapeseed oil is less costly to produce than soybean or corn oil because it does not need to undergo a winterizing treatment to prevent it from separating. But its price remains at a premium because of transportation costs during importation from Canada.

"Anything that comes in displaces what is already here," said Dave Kinard, Manager of Education and Research Services at the National Cottonseed Products Association, Memphis, TN. And canola, now mostly a specialty item, has the potential to make gains, Kinard said.

Jumping on the canola bandwagon in mid-1987 was Bunge Edible Oil, Kankakee, IL, who announced two canola (lear) based high stability oils. Hi S-N is a canola-based high stability oil offering 90 plus hours Active Oxygen Method (A.O.M.) with no additives or preservatives. Hi S-N 200 provides 200 plus hours A.O.M. On the retail front, Proctor & Gamble's Puritan Oil, made from canola oil, was on the market back in 1986.

Although the US fats and oils industry is up against some competition from producers overseas, it still leads the way with production of soybean oil and is making inroads with products such as olestra, the calorie-free oil from Proctor & Gamble (P&G). Pending FDA approval, olestra (also known generically as sucrose polyester) has the taste, appearance, texture, and cooking properties of natural oil, and is made by substituting sucrose for one of the two components of the fat molecule glycerol.

Late last year The Center for Science in the Public Interest asked FDA to deny approval of olestra, claiming it causes cancer, liver damage and other serious problems in animals. P&G refutes the claim and stands behind the safety of its product, explaining that the safety of olestra is backed by extensive scientific research.

If approved, olestra could revolutionize the oil and especially the low calorie food markets. Approval could come in the United Kingdom this year, followed by possible US approval in 1989. (For more information about olestra, see our cover story on the low, light and natural product trend on page 53 of this issue.)

Rising Imports

According to Business Trend Analysts, since 1978 demand from manufacturers of edible products for domestically produced fats and oils has risen 2.1 percent annually to 13.8 million pounds in 1986.

The two fastest growing end-use markets have been salad/cooking oils and baking/frying fats. These two areas have upped their consumption 2.8 percent and 2.5 percent annually due in part to the ever-growing fast food industry. Soybean oil continues to make gains with consumption up 2.2 percent yearly. The total supply of oil stocks jumped 3 percent in 1986 because of the palm, coconut, peanut, and rapeseed oils that are showing up more and more from foreign contenders.

It is important to keep in mind that coconut, palm and palm kernel oil account for less then five percent of the total oils consumed. Canola, on the other hand, is seen as the rising star.

Over the last decade one of these foreignly produced oils has made its mark more dramatically to consumers than any other: palm oil. Palm oil, as well as palm kernel and coconut oils, is found in many of the cookie, cracker, snack and cereal products Americans eat every day.

The changing roles of "good" and "bad" fats and oils has caused confusion in consumers and problems for processors. And the increase of coconut oil, and especially palm oil, into American diets has caused much debate.

Oils high in saturated fatty acids have been shown to raise blood serum cholesterol levels, which may lead to heart attacks. Polyunsaturated fats have been shown to reduce serum cholesterol. Because of their high content of saturated fatty acids, fats such as butter or lard do not melt at room temperature. In contrast, vegetable oils are liquid because of their high content of unsaturated fats. Exceptions to the rule: palm and coconut oils. Palm oil contains about 50 percent saturated fat, coconut about 92 percent, while soybean, for example, contains only 15 percent saturated fat. Despite its high level of saturated fat, the palm oil proponents say its make-up inhibits the build-up of cholesterol.

"Given other sources of saturated fat and cholesterol in the diet, people who need to modify their intake of saturated fat would be much more successful if they focused on other things that contain both saturated fat and cholesterol," said Steven Laning, VP of Research and Development for Capital Cities Products Company, Columbus, OH.

What most people seem to need to be reminded of is that no vegetable fat or oil contains cholesterol. In fact, food cholesterol comes from meat, eggs, milk, cheese and other animal products. All in all consumers would do well to reduce total fat in the diet, rather than just reducing the highly saturated fats such as coconut and palm oil.

According to research from Lipid Nutrition Lab, Human Research Center, in Beltsville, MD, the total amount of linoleic acid in the diet, and not its proportion to saturated fat is the determining factor in blood pressure level. Linoleic acid is the main polyunsaturated fatty acid in safflower, corn and soybean oils. According to this study, people would get the most benefit from reducing total fat while increasing vegetable oil in their diets.

While palm and coconut are seen as the "bad" guys, olive oil and the omega-3 fatty acids found in fish oils have been emerging as the heroes. Why? Because they are known to reduce overall blood cholesterol level, while at the same time increasing levels of high density lipoproteins, and destroying the low density lipoproteins (which nutritionists agree are bad). But, the fish oils brigade also has opponents. According to a speech presented at an American Heart Association meeting, the Eskimos of fish oil/low cholesterol fame had low cholesterol not because of the fish in their diets, but because they lead less stressful lives and eat small amounts of red meat. And in fact, some research shows that fish oil slows inflammation along artery walls, which may lead to hardening of the arteries.

Another one of the "good" oil guys is canola oil, which contains only 6 percent saturated fat, 36 percent polyunsaturated fat and 58 percent monounsaturated fat. Canola oil is lower in saturated fats than any other edible oil and contains high concentrations of omega-3 fatty acids.

Oil labeling

Legislation before the House of Representatives proposes required labeling of tropical oils and fats. The bill states that a product containing vegetable shortening in the form of tropical oil should identify the specific oil and designate it as a saturated fat.

The bill's opponents claim that legislation requiring a manufacturer to declare specific types of oils on the label eliminates their ability to choose oil based on price and availability. Manufacturers would either have to buy in large quantities or print different labels to deal with this legislation, placing a tremendous cost burden on the food industry, which would probably be passed on to the consumer.

Testifying before the House Agriculture subcommittee on Wheat, Soybeans, and Feed Grains, Acting Director of FDA's Center for Food Safety and Applied Nutrition Richard Ronk said that the so-called tropical oils cannot be classified together on the basis of their effects on blood lipids because these effects are distinctly different.

Ronk went on to say that it would be overly simplistic to assume any vegetable product containing a saturated fat in any amount will have adverse blood cholesterol consequences. Vegetable oils that are primarily unsaturated, such as soy and sunflower, can be saturated through hydrogenation (a process which reduces the degree of unsaturation of the fat) to achieve a particular effect in food. Therefore, the same health concerns that generally apply to both saturated fats apply as well to unsaturated fats that become saturated through the hydrogenation process, according to Ronk's testimony.

New technology

New extraction processes as well as biotechnological advances are also changing the face of the oils industry.

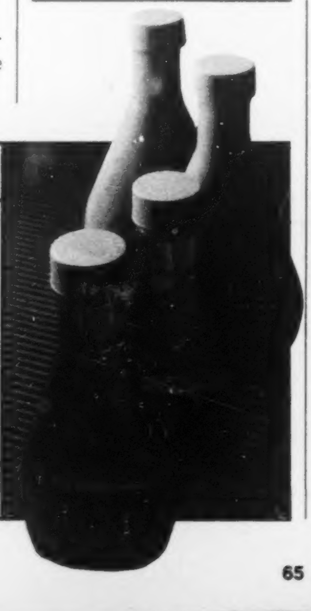
Fats and Oils Industry Shipments

(in millions of dollars)

	1977	1982	1986	1987
Cottonseed oil mills	$ 859	$ 933	$ 904	$ 940
Soybean oil mills	7,580	8,604	8,854	9,208
Vegetable oil mills	361	557	582	605
Animal/marine fats & oils	1,655	1,753	1,869	1,944
Shortening & cooking oils	4,025	4,906	5,743	5,972
Total	14,480	16,753	17,952	18,669

Source: U.S. Department of Commerce: Bureau of Census, and International Trade Association (ITA).

Oil industry shipments increased over 40 percent from 1977 to 1987. Photo courtesy Cargill, Minneapolis, MN.



The EPEX extraction process from Sverdrup, St. Louis, MO, produces commercial grade edible oil without chemical refining, and also produces all-natural edible meal. Using only natural ingredients, the process may outmode current technology that uses a highly explosive chemical, hexane, as a solvent.

The process (which is not supercritical extraction) has shown economic and environmental advantages over methods previously used by the vegetable oil industry. The oil produced has less than 0.1 phospholipids when deodorized.

The EPEX method involves:

- Preparing the soybeans or other edible oil seeds so that the extraction of oil from the prepared feed stock is easy and economical.
- Producing oil and meal at a lower production cost which are higher in quality than products produced using current extraction processes.
- Using no explosive solvents and containing all natural additives. Thus the products can be labeled "natural."
- Eliminating the need for chemical refining in producing commercial salad oil.

Those benefitting from the process include extractors and refiners and large end users such as commercial salad oil distributors and mayonnaise and salad dressing manufacturers. A new plant employing this technology should be built by summer.

Advances in biotechnology within the oil industry are underway at Sungene Technologies, San Jose, CA. Sungene received three patents last year for its advanced biotechnology processes to produce improved lines of sunflower plants from cell and tissue culture. This patented process results in sunflower seed having oil containing more than 95 percent oleic acid using one process and more than 80 percent linoleic acid using another process. With the controversy on fats and oils in the diet, these techniques will play a significant role in the oil industry. Sungene is involved with similar biotechnology work with other oilseeds including rapeseed, soybean and sesame.

Emulsifiers can eliminate shortening in cake mixes. Photo courtesy Durkee, Cleveland, OH.

Specialized emulsifiers

Specialized uses of emulsifiers and increased interest in natural products is the focus of the emulsifier industry.

Central Soya Company Inc., Fort Wayne IN, plans to expand its Bellevue, OH de-oiled lecithin processing facility, with construction set to begin in August. This expansion represents an increase of about 25 percent of current worldwide industry capacity, according to the company.

"Broad-base growth in special emulsifiers coupled with the food industry's interest in natural sources ingredients have created product demand," says Dr. D. L. Williams, senior VP of Central Soya's Chemergy Division, commenting on the planned expansion.

Reducing fat content in food formulations is the goal of *Dur-Lo*, a vegetable oil mono- and diglyceride emulsifier from Durkee, Cleveland, OH. Unlike similar emulsifiers, Dur-Lo is low in alpha mono content and relatively high in diglyceride content. It can replace all or part of the shortening content in cake mixes, cookies, icings and numerous vegetable dairy products, as well as reduce calories in these products.

Riceland Food Inc., Little Rock, AK offers *Lecigran*, a high phospholipid lecithin powder. By removing nearly all of the crude oil, this product does not interfere with flavor and its powdered form makes it easy to work with.

Eastman Chemical Products' (Kingsport, TN) emulsifier line includes *Myvatex* Monoset food emulsifier for stabilizing peanut butter that has good mouth feel and mouth release, has excellent spreadability in a wide temperature range, is resistant to oil separation, and has good stability at high temperatures. It is made from hydrogenated vegetable oils and distilled monoglycerides derived from vegetable oils. Myvatex SSH food emulsifier for baking is a concentrated product that is predispersed with an extended shelf-life. This hydrated crumb softener is prepared from distilled monoglycerides derived from edible vegetable oils. *Myverol* distilled monoglycerides contribute to the stability in products such as margarine (either regular or diet, and also spreads).

Circle 42 on Inquiry Card →

CHILTON'S

MARCH 1988

C2150-6
3/22/88

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

Coors®
SHENANDOAH

NEW PLANT OF THE YEAR

INTENTIONAL
BLANK

FOOD ENGINEERING

COVER STORY

Food Engineering's pick for our annual New Plant of the year is Coors Shenandoah Brewery, Elkton, VA. With the opening of this plant, Coors is one step closer to becoming a national brewer. Cover photograph by Tommy Thompson, Harrisonburg, VA.

Pages 65 to 79

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) March 1988, Vol. 60, No. 3. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

15 Industry Report
This month's Report talks about preventing product contamination through microbiological control; FDA's clarification of carcinogenicity in animals; and the Food Safety and Inspection Service revision of its policy spelling out Nutrition Labeling Verification (NLV) procedures for meat and poultry products.

Departments

9 Editorial
12 Calendar
15 Industry Report
29 Marketplace
37 Packaging
118 New In Print
139 People

INTERLOCKING BOTTLES: PAGE 37

Engineered Foods

46 Micro-Algae
Commercial large-scale culture of micro-algae is an emerging industry with major potential for modern agriculture.

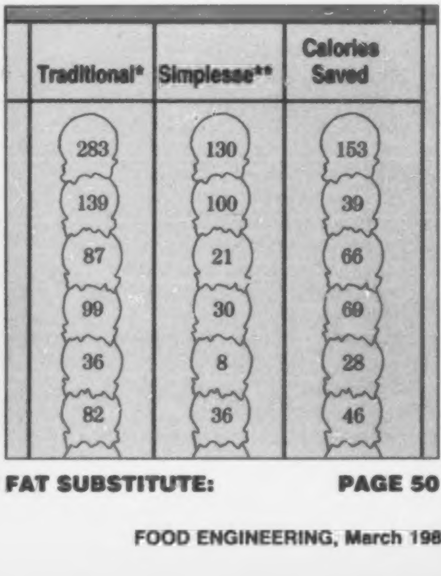
50 Simplesse™
Through a process based on microparticulation, Simplesse™ was developed to provide the taste and texture of fat.

52 Isolated Soy Protein
As a complete protein source, this ingredient can be used in products such as meal replacers and weight control foods.

57 Insta*Starch
By using one of several new Insta*Starch forms, the amount of starch in food formulations can be reduced.

58 Biotechnology
What directions are our technical achievements in this area taking us? Will we be competitive in a world market?

62 Literature



Traditional*	Simplesse**	Calories Saved
283	130	153
139	100	39
87	21	66
99	30	69
36	8	28
82	36	46

FAT SUBSTITUTE: PAGE 50

CHILTON
FOOD
GROUP

Features

65 New Plant of the Year
Coors Shenandoah Brewery is a $100 million plant that rolls out 2-1/2 million bbls. per year, and will grow to a $1 billion, 10-million-bbl.-per year plant when completed.

81 Japan Products Market
From upside-down cans to gourmet microwave items, the innovative Japanese food product market marches on.

85 Equipment Buyers Survey
Our Executive Advisory Panel gives its measures, thoughts, and ideas on budgets, equipment purchases, and production projections for the year ahead. On the whole, it looks like 1988 will be a good year.

93 Aseptic Processing
Aseptics are poised to move from a base of juices and drinks into a broader range of processed foods.

CONTROL STATION: **PAGE 65**

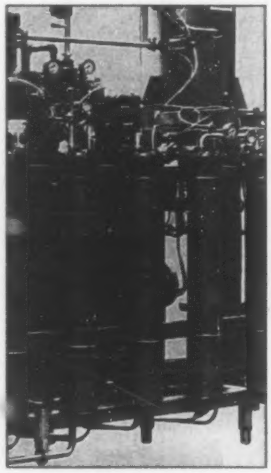
From the Field

101 Food processors bet on on-line NIR analysis for big gains
106 Food allergens and product liability risks for processors
108 Pickle plant cures downtime with conveyors
110 Pesticide control program ups standards 75 percent
112 Vegetable packer uses high pressure hot water
113 Coffee company steams ahead with computer system
114 Hungarian corn processing construction successful

New Equipment

121 Processing Equipment
129 Packaging Equipment
133 Instruments/QC

PESTICIDE CONTROL: **PAGE 110**



Special Emphasis

ASEPTIC PROCESSING
Although the aseptic packaging technique has found a niche in the beverage market, the broad success predicted for aseptics in the processed foods area has thus far proved elusive.

Pages 93 to 99

Japanese place priority on new products

The Japanese apparently place as much importance on new product development as we do. However, they also place a great deal of importance on new technology. The dynamics and importance of new product and technology developments in the Japanese processed foods and food packaging industry is highlighted by the results of a recent survey conducted for Yanese and Associates.

2,800 new products

According to Yanese and Associates, Japan's dramatic economic success and growth is largely attributable to two primary factors – intense domestic competition for market share and the development of high value-added products. As a result, while the U.S. has twice the population of Japan, Japanese new product introductions are nearly four times as great on a per capita basis. Nearly 2,800 new food products were launched in the Japa-

JAPANESE FOOD MANUFACTURING PRIORITIES

New Product Development	83.3%
Technology Development	66.6%
Profit Increases	63.8%
Development of Individual Talent	63.8%
Information Network	62.2%
Internationalization	58.3%
Increase Market Share	52.7%
Countermeasures for Distribution	50.0%
Entry into the New Business	47.2%
Countermeasures against Sales Tax	47.2%
Sales Increase	44.4%
Cost Reduction	44.4%
Facility Investment	33.3%
Promotion of Consumption	33.3%
Biotechnology R&D	30.5%
Mergers & Acquisitions	25.0%
Countermeasures Against Strong Yen	19.4%
Enhanced Corporate Identity	16.6%
Measures for Market Conditions	13.8%
Measures for Employment	10.8%

Source: Nippon Shokuryo Shimbun

Seventy-two managers of major Japanese food companies considered new product and technology development as the major focus of their strategy.

nese retail market in 1985.

The survey polled seventy-two managers of major Japanese food companies. They indicated that new product and technology development are foremost in their business plans. The Japanese managers stated that the introduction of new products is necessary to satisfy changing consumer requirements. Technological innovation efforts will be focused on processing techniques, ingredients, inspection methods and packaging.

FSIS revises policy on nutrition labeling

In response to suggestions submitted by the National Food Processors Association last fall, the Food Safety and Inspection Service has revised its policy spelling out Nutrition Labeling Verification (NLV) procedures for meat and poultry products.

The revised policy, issued January 26 includes:

- Deletion of requirements to list in-process controls;
- Provision of a one-year period to companies to build a nutrient database during which action would be taken by FSIS only in case of gross violations;
- Granting by FSIS of some exceptions to the 80 percent/120 percent allowance for variations in label declarations in subsequent years;
- Designation of the assistant deputy administrator of regional operations as coordinator of NLV program approvals for firms with plants in several USDA regions.

The original policy memo was released by FSIS in November, 1986, and served as an advisory to industry on the procedures followed by USDA in ensuring the accuracy of nutrition information voluntarily provided by meat and poultry processors on their products. Members of NFPS's Meat and Poultry Products Technical Committee found provisions of the policy unnecessarily burdensome, and informed FSIS that these provisions would discourage processors from voluntarily providing nutritional information on their products.

Copies of the revised policy memo can be obtained from NFPA's Lloyd Hontz, (202) 639-5924.

Yield/quality grading to be separated?

In response to a petition filed by AMI and National Cattlemen's Association, USDA has published a proposal to separate yield and quality grading. "This gives packers who choose to do so, the flexibility to remove excess carcass fat on the slaughter floor," said AMI President Manly Molpus.

Current rules deny packers this option, because USDA requires that, if carcasses are graded, both the yield and the quality grade must be determined. This prohibits hot-fat trimming because graders are unable to determine the yield grade if the fat has been removed prior to grading.

The new proposal would not affect existing grade standards.

DELAWA
TOM
PAS
NET WT 6

Cut your location decision down to size

Delaware is the small state with big advantages for food processors. Like fast, extensive transportation systems that put you no more than a day away from one-third of America's population. An abundant, clean water supply, including the Delaware River. A growing, skilled workforce that remains very cost competitive. Plus, there's a reason you won't find on a map or in a mound of statistics: accessibility of state government. **Circle 23 on Inquiry Card**

Delaware's smaller size makes management easier, information quickly available, and real help as close as your phone. Prove it to yourself, and simplify your location decision-making. Call the Delaware Development Office. (302) 736-4271

DELAWARE
SMALL WONDER

U.S. forges ahead in Agricultural Biotechnology

What directions are our technical achievements in this area taking us? Will we be competitive in a world market?

The U.S. always has been a world leader in developing new technologies – including ones relating to the food processing industry. But concerns about our ability to be first with many of these technologies in a world market have been surfacing.

These concerns – especially as they apply to capitalizing on federal R&D – were addressed by Clarence J. Brown, Deputy Secretary of Commerce, U.S. Department of Commerce at AgBIOTECH '88, a conference on agricultural biotechnology held last January in Washington D.C.

"The U.S. Government spends approximately $60 billion annually on R&D. Not enough of this R&D finds its way into the commercial marketplace," stated Brown. Most companies, whether they realize it or not, are in foreign competition, since 97 percent of the items manufactured in this country – even if they are sold in this country – have foreign competition, he pointed out.

"America's ability to exploit new technologies with huge market potential in the year 2000 and beyond will determine our ability to compete," said Brown. The Department of Commerce recently concluded a major study identifying the primary emerging technologies that will drive the world economy well into the twenty-first century. Within that group, biotechnology – both genetic engineering and biochemical processing – are tagged as having significant potential economic impact.

Commerce Department Policy Recommendations

1. Reduce Federal budget deficit.
2. Create venture capital pools at state and local levels.
3. Create additional tax incentives and other actions to increase savings.
4. Tax law changes should give incentive to modernize.
5. Insist on protection of intellectual property.
6. Train managers in production process; update business schools' curricula.
7. Eliminate discriminary foreign tax provisions.
8. Improve export controls.
9. Reform product liability and tort laws.
10. Clarify and ease antitrust restrictions.

Clarence J. Brown, Deputy Secretary of Commerce, U.S. Department of Commerce listed the Department's recommendations to remove the barriers which stand in the way of the U.S. obtaining maximum benefit from emerging technologies.

Brown listed a number of generic barriers to achieving maximum economic benefit from these emerging technologies:

- High cost of capital in the U.S.,
- U.S. versus foreign tax incentives,
- Management focusing on short-term return on investment,
- Poor integration of manufacturing, design, and R&D functions,
- Inadequate intellectual property protection,
- Compliance and dependence on domestic market,
- Restrictive trade policies in foreign markets,
- Health and safety regulations,
- Export controls on advanced technologies and products,
- Product liability and tort law restraints, and
- Antitrust restrictions.

The Department of Commerce has pushed for a decentralized management of technology to permit the individuals who develop this technology to own and benefit from their discoveries. During the '80s, new laws are allowing universities, small businesses, and all other contractors financed by federal funds the first right of ownership and profit from their patentable inventions developed with federal dollars. And the Technology Transfer Act of 1986 allows similar rights for technology originating in federally funded laboratories.

The Department of Commerce study includes a number of recommendations to remove the barriers identified. These in listed in the accompanying chart.

"No valid reason exists for America losing its technological leadership in the world," stressed Brown. "All the elements of technical supremacy are available if we will use them."

ANN E. PRZYBYLA
Technical Editor

Circle 46 or see FEM, p. 236 →

Dr. Anthony Walker of Arthur D. Little's United Kingdom office compared research priorities within U.S. and European companies involved in plant biotechnology. In Europe there are fewer specialist biotechnology companies than in the U.S. Much of plant biotechnology research in Europe is carried out in larger corporations such as Unilever which recently purchased the Plant Breeding Institute, Bayer, and Hoechst. This denies the U.S. access to European expertise, Walker pointed out.

> *"The U.S. looks at agricultural biotechnology more from a pure investment point of view of a defensive position, while the Europeans look at this technology more as a marketing outlet in addition to a defensive role."*

Walker went on to say that companies in the U.S. look at agricultural biotechnology more from a pure investment point of view or a defensive position, while the Europeans look at this technology more as a marketing outlet in addition to a defensive role.

Establish business first

Companies interested in agricultural biotechnology are being encouraged to establish a business position prior to developing the technology.

"As opposed to investing strictly in technology, we have stressed the need for development of strong production and marketing businesses that would be able to capitalize on the most advanced technologies as they are developed," said John R. Hesse, Managing General Partner, Plant Resources Venture Funds, Cambridge, MA. He explained that this was partly because of the potentially lengthy product development cycle for new products based on genetic improvements of plants and animals – whether by traditional breeding technology or by genetic engineering.

Product positioning

One company, while not involved in the more sophisticated aspects of biotechnology, realizes the importance of properly positioning its products. Columbia, MD-based Igene Biotechnology Inc. recently turned down a proposal to provide Macromin (a low cost nonfat dry milk produced from whey) to a major bakery company, because it did not want to become a high-volume, low-cost commodity producer. Instead the company will look at specialty niche markets such as angel food cake mix.

Agricultural biotechnology historically has had problems attracting investment dollars – especially compared to human health care biotechnology research. The gap does not appropriately reflect the relative size of the markets of the high value sectors within agribusiness, stated Hesse. He attributed this lack of funding to several factors, including insufficient public and investor awareness of the high value sectors of the agricultural input and processing industries, higher visibility to investors of products with potential impact on major human diseases, and technical hurdles specific to the agricultural biotechnology field.

Biochemical pathways

While many of the genetically engineered pharmaceutical products only involve individual proteins encoded by single genes, certain of the more attractive agricultural opportunities involve the manipulation of entire biochemical pathways, the effects of multiple genes, or the interaction between hosts and pathogens, points out Hesse. A major hurdle was overcome, though, with the successful regeneration of whole plants from single cells that were transformed with exogenous DNA.

Some chemicals involved in food processing are relatively simple and can be genetically engineered in microorganisms. For example, DNA Plant Technology Corp., Cinnaminson, NJ, is using somoclonal variation (growing new plants from a few plant cells) to select naturally occurring strains of popcorn which have a butter-like flavor.

"Recent breakthroughs in the transformation of cereal species, and development of novel transformation technologies, encourage our expectations that genetically engineered field crops will reach the marketplace in the 1990's," predicted Hesse. He concluded by stating that total sales of agricultural biotechnology products will go from $25 million in 1988 to $700 million in 1993.

Due to a number of initial public offerings for agricultural biotechnology companies in the past few years, it is possible to compare corporate strategies and stages of product development of these small companies. Dr. Nanette Newell, founder and Principal of The Synertech Group – a venture capital group in North Carolina, analyzed the technological competence, value added products, and vertical integration schemes of these companies.

Funded Corporate Relationships

	Company	Total
AGS	DuPont, Hilleshog, Karlshamns	3
Calgene	Procter & Gamble, Campbell Soup, Philip Morris, Rhone Poulenc, Kemira Oy, Roussel Uclaf, Ciba Geigy, one other	8
DNAP	Campbell Soup, General Foods, Hershey Foods, American Home Products, Farms of Texas, Koppers, CPC International, Du Pont, Brown & Williamson, Firmenich	10
Escagen	American Maize Products, Anheuser Busch, Del Monte, Harris Moran, Lafarge Coppee, Sime Darby, two others	8
NPI	McCormick	1
PGI	McCormick, Kirin	2

Souce: The Synertech Group, Inc.

Many major U.S. companies have funded corporate relationships with agricultural biotechnology speciality companies.

She presented the finding at the AgBIOTECH conference.

Newell said that the successful companies will not only have expertise in the key technologies of breeding; tissue and cell culture; and molecular biology and biochemistry, but will also diversify into several crops. Her results are shown in the chart.

	Technology	Crop Diversity	Value Added Products	Corporate Relationships	Vertical Integration	Revenues from Biotech Products	Market Value ($MM, 11/23/87)
AGS*	+ +	+ + +	-	+	-	+	45
Calgene	+ +	+ + +	+	+ +	+	-	40
DNAP*	+	+ +	+ +	+ +	-	-	53
Escagen	+ + +	+ + +	+ +	+ +	+	-	17
NPI	+ + +	+ +	+	+	+ +	+ + +	NA
PGI	+ +	+	-	+	+	+	24

* On December 17, 1987, it was announced that DNA Plant Technology Corporation and Advanced Genetics Sciences, Inc. had approved an agreement in principle for the two companies to merge.

Source: The Synertech Group, Inc.

The Synertech Group analysed corporate strategies of a number of companies involved in agricultural biotechnology. The results are shown above with rating going from (-) = No significant activity to (+ + +) = Key area of activity for the company.

Public opinion critical

While federal regulations governing biotechnology will have a major impact on the timing, direction, and impact of this technology, the American public's opinions and perceptions will be an important component in the federal government's role of managing the technology. These attitudes were explored in a nationwide survey conducted by Louis Harris & Associates for the Congressional Office of Technology (OTA).

Dr. Robyn Y. Nishimi, Analyst and Study Director, OTA, reported that support for continued biotechnological research appears in all segments of the population.

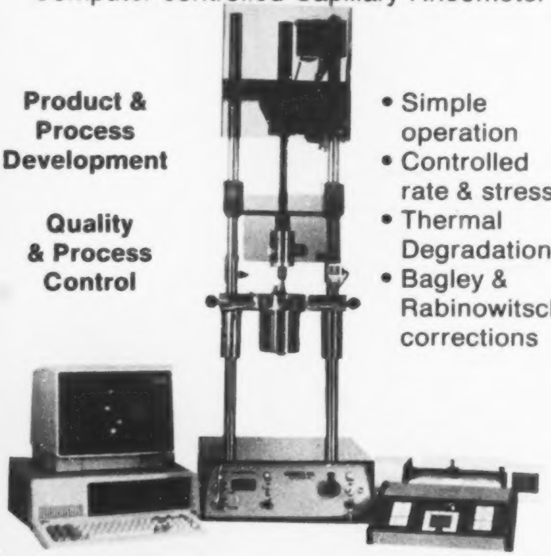
"The public perceives that the benefits of biotechnology, including agricultural applications, are sufficient to justify the risks—but that strict regulation is necessary," he added.

FLOW MEASUREMENT
Computer-controlled Capillary Rheometer

Product & Process Development

Quality & Process Control

- Simple operation
- Controlled rate & stress
- Thermal Degradation
- Bagley & Rabinowitsch corrections



KAYENESS also manufactures melt indexers, tensile and impact machines and other physical property testing equipment

KAYENESS INC.

Call/write for literature
215-273-3711
RD3, Box 30, Honey Brook, PA 19344

Circle 20 on Inquiry Card

Super Performance!

Lubriplate delivers, with a complete line of USDA H-1 approved lubricants.

Lubriplate ACL Greases come in three NLGI densities and have working ranges from −30°F. to +400°F.

They are extremely water resistant and protect against the effects of steam and acids.

They have outstanding shear stability and are very tacky and adherent.

Lubriplate FMO Oils come in six SAE grades and are suitable for multiple applications.

ACL-2
THE MODERN LUBRICANT
LUBRIPLATE
FISKE BROTHERS REFINING CO.

LUBRIPLATE® LUBRICANTS
Quality/Performance/Value

LUBRIPLATE DIVISION FISKE BROTHERS REFINING COMPANY 129 LOCKWOOD ST NEWARK, N.J. 07105
PLANTS IN NEWARK NJ & TOLEDO OHIO DISTRIBUTORS WORLDWIDE CALL 201 589-9150 FOR MORE DATA

Circle 48 on Inquiry Card

CAPITAL SPENDING '88

EQUIPMENT BUYERS' SURVEY

Our Executive Advisory Panel gives its measures, thoughts, and ideas on budgets, equipment purchases, and production projections for the year ahead.

FOOD ENGINEERING'S
EXECUTIVE
ADVISORY
PANEL

This year's Equipment Buyers' Survey drew 319 responses from members representing a wide range of disciplines.

Black Monday on Wall Street may have left the money men shaken, but the inherent stability of the food industry, combined with ever-improving productivity, and the continuing low raw materials prices is leaving enthusiasm undiminished.

An indication of this is that once again this year, the *Food Engineering* Executive Advisory Panel reports a feeling of optimism about the outlook for their companies. Consider for a moment just one number: 65.8% of the panel projected production increases in their facilities for 1988. As one surveyee noted, 1988 "should be our best year for the introduction of new products and a new line!" Another was a bit more terse but no less pumped up: "Looks good to me!"

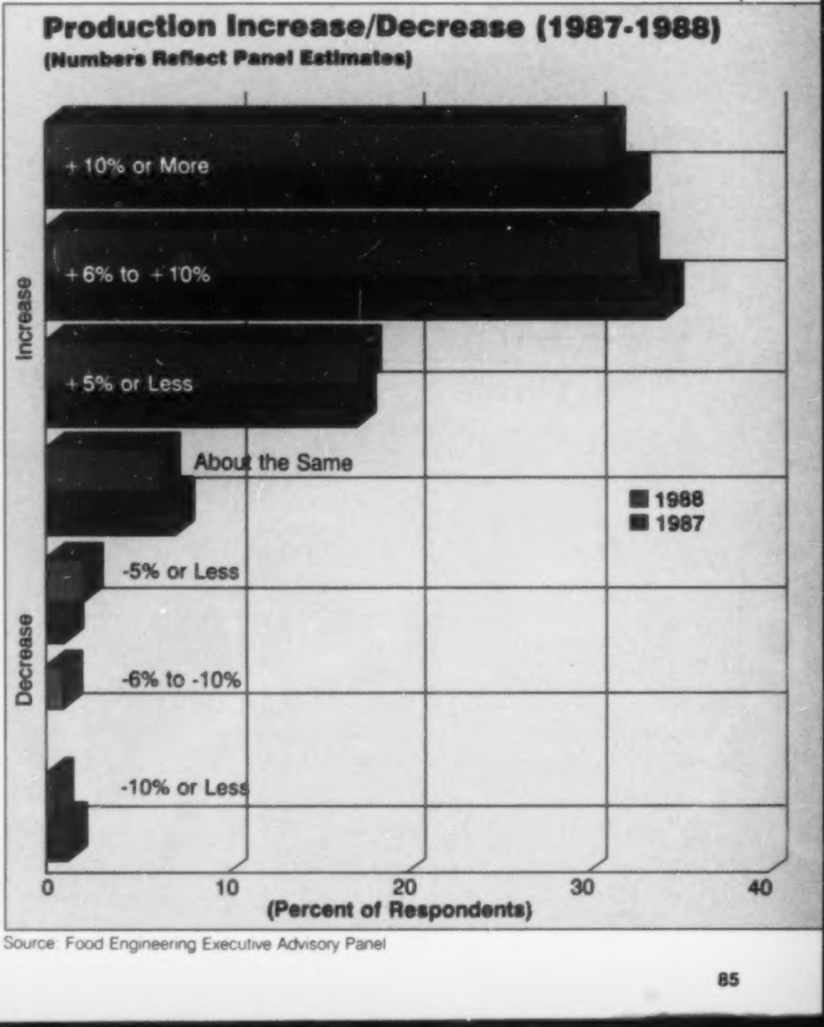
Company projections

As might be expected, the largest numbers (at least on a percentage basis) came from the smaller companies where opportunities for expansion are greater when compared to the bigger players. Almost 31 percent of the respondents at companies with less than 100 employees feel their plants are looking at 1988 production increases of over 10%. Medium-size companies (100-500 employees) were not, however, far behind, with 27.8 percent expecting a 10+ percent production pickup. Even at large companies (over 500 workers) a respectable 16.3 percent felt things would go the same way for 1988.

Company expenditures

A lot of ink has been spilled about mergers, consolidations, and the big getting bigger and pushing smaller companies out of markets. In light of these facts, a meaningful pattern emerged when we asked respondents what their capital equipment budgets were going to be company-wide in 1988.

MARGIE J. RUSSELL
Senior Associate Editor


Production Increase/Decrease (1987-1988)
(Numbers Reflect Panel Estimates)

Source: Food Engineering Executive Advisory Panel

Budgeting, 1988, By Segment

Dollar figures reflect company wide equipment budgets for fiscal 1988

	Under 50K	50-99K	100-249K	250-499K	500-999K	1M-1.9M	2-4.9M	5+M
Meat	6.7	9.0	10.1	9.0	4.5	10.1	14.6	21.3
Bakery	15.1	5.5	8.2	9.6	2.7	5.5	12.3	28.8
Dairy	9.6	8.5	7.4	7.4	4.3	5.3	13.8	29.8
Flavors/Ingredients	15.7	6.0	13.3	6.0	7.2	2.4	14.5	22.9
Canned Fruit/Vegetables	3.5	1.8	8.8	7.0	8.8	7.0	14.0	36.8
Fats/Oils	13.2	3.8	13.2	9.4	5.7	3.8	15.1	20.8
Frozen Fruit/Vegetables	14.6	7.3	9.8	9.8	0.0	12.2	17.1	17.1
Confectionery Products	11.8	2.0	5.9	5.9	7.8	5.9	11.8	33.3
Cereals/Grain Products	8.8	5.9	7.4	4.4	2.9	8.8	19.1	30.9
Beverages	11.1	8.3	9.7	8.3	5.6	5.6	6.9	33.3
Other	6.8	10.2	12.5	8.0	4.5	9.1	11.4	30.7

Percentages may not add up to 100% because of multiple responses or partial responses
Source: Food Engineering Executive Advisory Panel

For one thing, the big are not abating spending in any way. Of those companies projecting a $5 + MM capital expenses budget, 50 percent were companies with over 500 employees. Less than half that percentage (23.3) of the midsize companies were going to spend an equivalent amount, and barely 5% of small companies would be. Couple this with the fact that 47.7 percent of the large companies and 46.6 percent of midsize companies indicated that expansion and retrofit of existing lines was a major force driving capital expenditures in 1988, and you begin to get a picture of why the small processor, unless well-niched, will continue to have trouble keeping up. In fact, over 60 percent of the small companies will be holding their new purchases to under a quarter of a million dollars.

Last but not least, it should also be noted that the percentage of small companies indicating that they would spend $5 + MM dropped by almost half in this year's survey: In 1987 it was 10.1 percent, while this year it is only 5.1 percent. (It is interesting, however, as pointed out above, that even in the face of heavy competition, a large chunk of the small-plant segment is still predicting healthy production gains.)

In general, more than 46 percent of the

Production Projections, 1988 By Segment

Projections are for company-wide production increases/decreases compared to 1987.

	DECREASE			NO CHANGE	INCREASE		
	10+%	6-10%	Under 5%	0	Under 5%	6-10%	10+%
Meat	0.0	1.1	3.4	4.5	15.7	31.5	33.7
Bakery	1.4	1.4	2.7	5.5	20.5	27.4	35.6
Dairy	0.0	1.1	4.3	3.2	20.2	29.8	34.0
Flavors/Ingredients	0.0	0.0	2.4	4.8	18.1	31.3	33.7
Canned Fruit/Vegetables	0.0	0.0	1.8	10.5	21.1	38.6	17.5
Fats/Oils	0.0	0.0	0.0	3.8	17.0	37.7	28.3
Frozen fruit/Vegetables	0.0	0.0	4.9	9.8	14.6	34.1	24.4
Confectionery Products	0.0	0.0	2.0	5.9	29.4	29.4	21.6
Cereals/Grain Products	0.0	0.0	2.9	4.4	13.2	44.1	27.9
Beverages	0.0	0.0	2.8	12.5	26.4	31.9	22.2
Other	0.0	1.1	1.1	3.4	14.8	33.0	39.8

Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Executive Advisory Panel

companies surveyed will be in the "million dollar club," projecting expenditures of $1M and up. And almost 25 percent of the companies fall in the $5M+ range.

Purchasing factors

As we reported in our November issue on new construction, retrofit and expansion of existing lines, while difficult to do without disrupting production, are the preferred methods for increasing a plant's manufacturing capabilities. For example, when asked what factors would drive the purchase of equipment for their companies in 1988, only 27.6 percent of the respondents said that new construction would be a major factor (on the low end was confectionery, which came in at about 17.6 percent; at the high end was cereals/grain products at close to 30 percent).

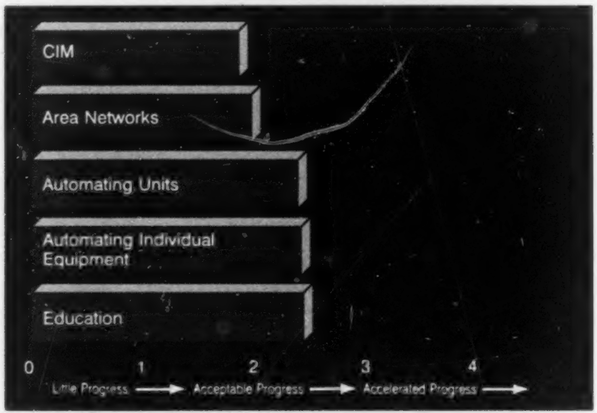
On the other hand, 48.3 percent of the respondents felt that retrofit/expansion of existing lines was a major factor (high was cereals/grain products at 67.6 percent and low was confectionery at 39.2 percent). This includes improving line speeds (42 percent thought it would be a major factor in their 1988 equipment decisions); better process control (39.5 percent), particularly in bakery and cereal products (both at 50 percent); improved on-line QC (31.7 percent), particularly again in bakery (45.2 percent) and cereal (47.1 percent); need for more flexible manufacturing (29.8 percent); need to control excessive downtime (29.8 percent) and improved cleanability (19.4 percent).

Process control

While a lot of companies felt that improved process control would be a key factor in equipment decisions, we wanted to see what the nitty gritty of the present situation really was. The panel was asked to rate their location's progress in several different process control activities: Automating individual equipment, automating processing units and creating distributed control systems, developing full-bore CIM information systems, and educating personnel in process control. Not surprisingly, because the industry is still in the first stages of transition from automation to post-automation computer control, the largest single category of answer was, "Some progress but not much" (depending on the activity, anywhere from 20-37 percent responded this way).

Asked about accelerated progress in these activities, the largest response was pretty small: 6.6 percent of the companies felt they were making accelerated progress in automating processing units.

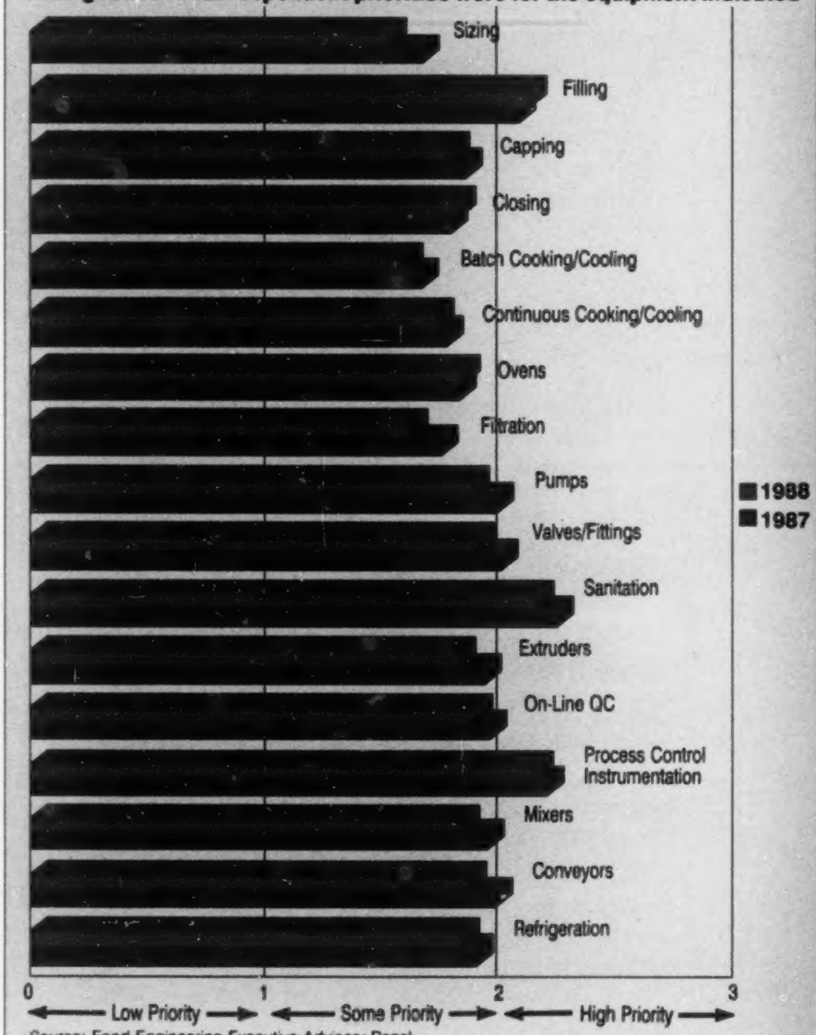
Progress In Process Control Respondents were asked how far along their plants were in different stages of process control



Source: Food Engineering Executive Advisory Panel

Purchase Priority (1987 - 88)

Ratings show what respondent priorities were for the equipment indicated



Source: Food Engineering Executive Advisory Panel

Why such tentative movement? The answers came back loud and clear: Almost half the panel noted cost as a major reason their location was not where they felt it should be in process control. The other, and even more difficult problem, listed by 46.7 percent of the respondents, was NO COMPANY PLAN!

In addition, the panel was asked to rate the important issues in introducing a new piece of process control equipment into their production operations. Some of the things the panel was asked to consider were ease of use, ease of training, user-friendliness of the equipment, report generation capability, ease of programmability, flexibility, and supplier backup. The issues were rated on a scale of 0-3, where 0-1 indicated an unimportant issue for the panel member; 1-2, important but not critical; and 2-3, a critical issue.

The issue the panel rated on top was supplier backup, with a mean score of 2.75. Flexibility was the second most critical matter (2.65), and ease of use was third (2.63). Fortunately for the industry, these were precisely the issues that suppliers of process control equipment were addressing at last year's IEFP and Dairy Expo shows. So at least the help is out there if planning and dollars can be organized to get the job done.

Installation time

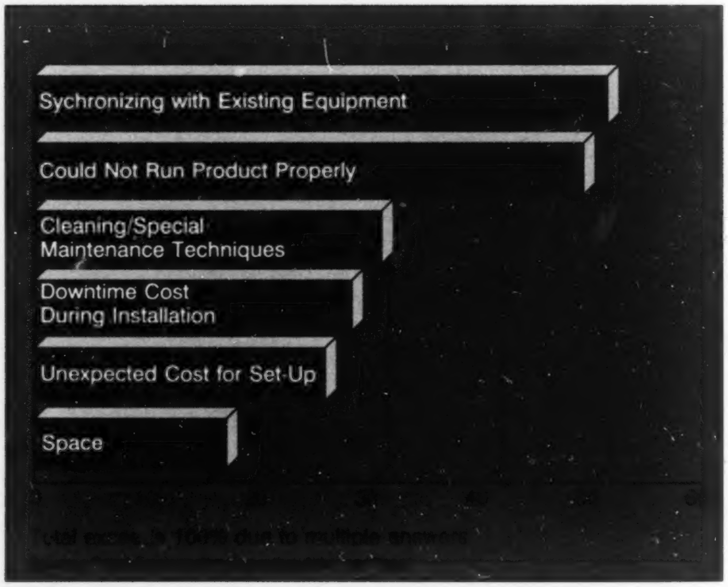
Getting a piece of equipment or a control system up and running is one of the great challenges for plant engineering and QC. Space/location problems, whether the equipment as delivered can run the product properly, special maintenance requirements, and unexpected downtime can all make installation an illustration of that old principle that whatever could go wrong will go wrong. So first we wanted to know how long it took to get new equipment up and running. Most plants (48.4 percent) get things humming (or at least adequately stumbling along) in less than three months, and 32.2 percent in less than one month. The variances often come from the size of the company, larger companies generally getting it done slower, and smaller companies faster.

Some of the faster times were turned in by the meat segment (36 percent of the respondents reporting it took them less than a month to get equipment in), frozen fruit and vegetable (31.7 percent), and beverage (30.6). There were a few cereal and bakery products respondents, however, who were taking a year or more to get equipment in, but these were clearly the exception, even in those segments.

According to our panel, by far the two most serious problems encountered in getting new equipment up and running were synchronizing the new equipment and being able to run the product to spec. Most hangups seemed to be in the confectionery area, with 54.9 percent of the confectionery respondents saying that these were serious problems for them. Not far behind were fats and oils producers (54.7) and bakery (51.4).

Problems In Getting Equipment Up and Running

Where characteristically had respondents experienced problems?



Total exceeds 100% due to multiple answers

Panel ideas

Last but certainly not least, we let the panel speak its mind on ideas for machinery that they needed but that is not available from any supplier. Not surprisingly, many manufacturers are looking for new equipment that can be matched to new products.

Interestingly, many respondents said that a lot of the equipment they are looking for is rather simple machinery that would solve rather simple production problems. For example, one panelist wanted "a machine to pack sausage in a box." On the other hand, two respondents wanted "high-speed fillers (150-300 units/minute) for plastic containers," and "a data collection computer that also can do process control." Another wanted, "an on-line salt analyzer." Sometimes technology is not the answer, as we were reminded by the panelist who asked for "employees that show up on time!" This last one may prove to be the most complex request, and the trouble is that it will never be available from any supplier.

CHILTON'S

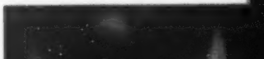
APRIL 1988

4/25/88
C2150-6 -

FOOD ENGINEERING

SINCE 1928 THE SOURCE ON PROCESSING, PACKAGING AND PRODUCT DEVELOPMENT

8th ANNUAL NEW PRODUCT ANALYSIS



WHAT'S HOT

FOOD ENGINEERING

COVER STORY

With 3,584 new products introduced in 1987 fighting for shelf space, share of market becomes increasingly important. *Food Engineering's* eighth annual new product analysis explores the hottest food trends.

Pages 89 to 116

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) April 1988, Vol. 60, No. 4. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

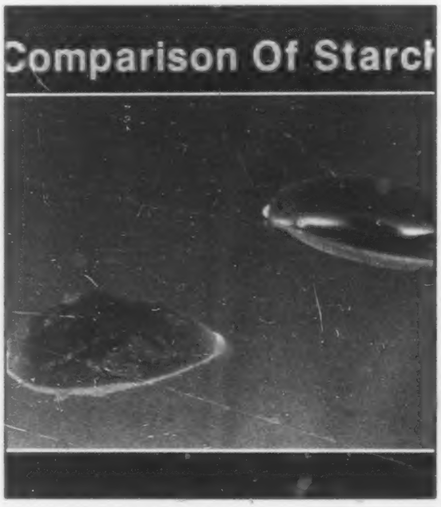
News

16 Industry Report

This month's Report talks about FDA's rule of barring *sous vide* in U.S. restaurants; the plans underway for a turnkey American pavilion at the GIA show in Paris; why health claims from some manufacturers could have a negative effect; the world's largest automated pasta plant scheduled for start-up in August; and why manufacturers may be more accountable to consumers in the future.

Departments

9 Editorial
12 Calendar
16 Industry Report
45 Ingredients
178 New In Print
202 People



NEW CWS STARCHES: PAGE 45

Food Packaging

52 Time/Temperature Labels

New technologies can measure the combined effect of time and temperature on refrigerated fresh foods.

60 PVDC Recycling

Until now, the difficulty of utilizing PVDC in a regrind layer has restricted its use in rigid barrier packaging.

62 More Formable EVOH

This second generation of higher-barrier EVOH incorporates an organic material to provide mechanical reinforcement.

65 Barrier Foam Trays

Barrier-laminated, expanded polystyrene foam tray sealed with barrier film doubles product shelf life.

68 Bellows Bottles

These plastic bottles are designed to expand and collapse to fit specific food and beverage applications.

70 Trendwatch
75 Literature

PERDUE DONE IT!
PERDUE DONE IT!

EXTENDED SHELF LIFE: PAGE 65

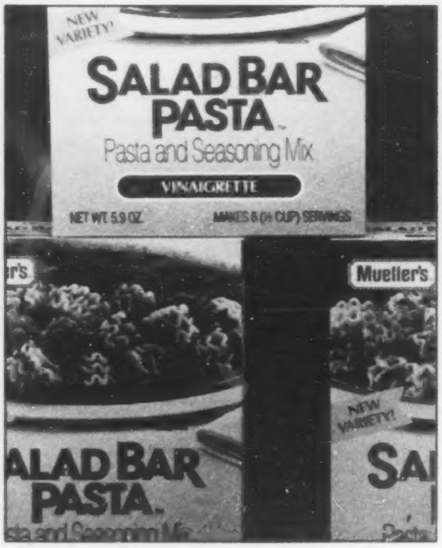
CHILTON
FOOD
GROUP

Features

89 New Product Analysis
Competition for market share of prepared food items has always been tough. The bad news is it's becoming tougher. The good news is that the demand for further processed, value-added foods is climbing.

118 Research & Development
Food Engineering polled 10,000 research and development people across the food industry. In food companies, universities and independent research labs, activity goes on unabated in the attempt to match consumer wants with company needs.

139 Powder & Bulk Handling
Material handling equipment appears to be leaving its conservative stages and entering the realm of computer automation.



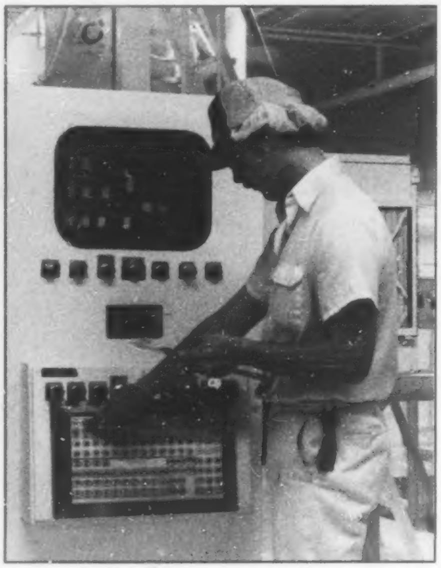
SALAD BAR PASTA: PAGE 89

From the Field

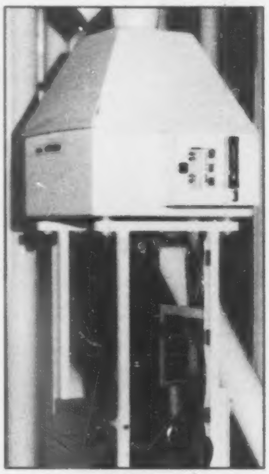
149 Blending facility achieves cost, flexibility with automation
152 Choosing the right tubing is more than a matter of taste
157 Advanced controls increase productivity in filtration line
160 Solid-state drives boost pasteurization productivity

New Equipment

185 Processing Equipment
191 Sanitation & Maintenance
197 Handling & Distribution



FLEXIBLE CONTROLLER: PAGE 149



Special Emphasis

POWDER & BULK HANDLING

Current working environments, combined with a need for faster and more efficient production, have created a new look in the material handling equipment market.

Pages 139 to 146

8th ANNUAL NEW PRODUCT ANALYSIS

Microwave-specific: Problems previously associated with the quality of foods prepared in the microwave are being tackled. **94**

Cajun & other ethnic foods: Americans are developing more adventuresome eating habits. **97**

Sauces: A vast range of new sauces was seen. **100**

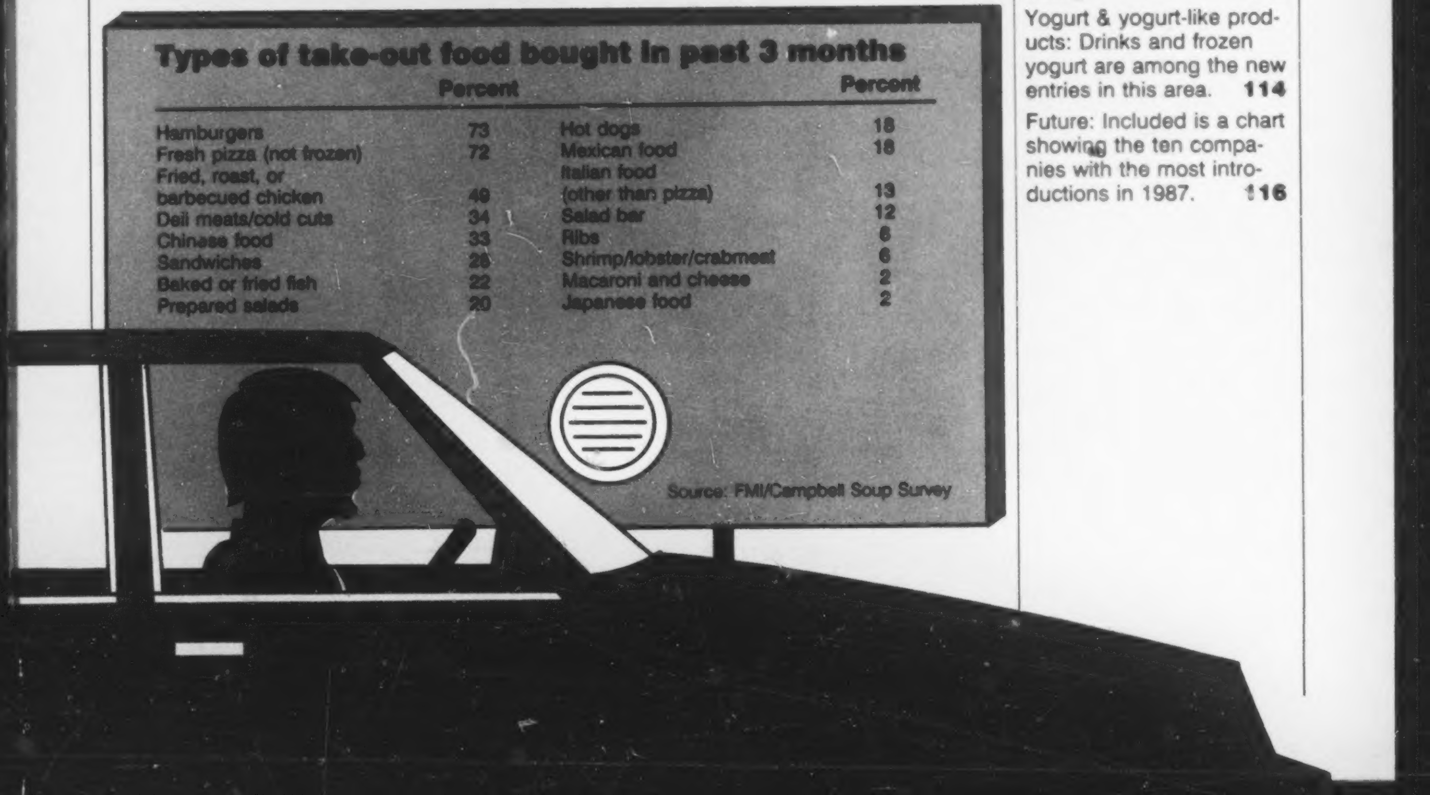
Pasta & rice products: New pasta products range from dry-packaged to refrigerated to frozen. **102**

Bottled water, seltzers and other carbonated drinks: Disagreements exist of defining segments within this category. **106**

Fiber-, calcium-added: New foods in this category are aimed at consumers interested in healthy eating. **110**

Yogurt & yogurt-like products: Drinks and frozen yogurt are among the new entries in this area. **114**

Future: Included is a chart showing the ten companies with the most introductions in 1987. **116**



Types of take-out food bought in past 3 months

	Percent		Percent
Hamburgers	73	Hot dogs	18
Fresh pizza (not frozen)	72	Mexican food	18
Fried, roast, or barbecued chicken	49	Italian food (other than pizza)	13
Deli meats/cold cuts	34	Salad bar	12
Chinese food	33	Ribs	6
Sandwiches	28	Shrimp/lobster/crabmeat	6
Baked or fried fish	22	Macaroni and cheese	2
Prepared salads	20	Japanese food	2

Source: FMI/Campbell Soup Survey

NEW PRODUCT ANALYSIS

	Total Intros.	New brands/ lines	Brand exts.	Line exts.	Total SKUS
Baby food	8	4	-	4	35
Baking mixes	37	10	4	23	74
Bread & bread products	121	35	3	83	232
Cake mixes	16	2	-	14	28
Catsup	8	1	-	7	12
Cereals	86	15	1	70	140
Cheese	76	13	4	59	168
Chewing gum	13	1	-	12	29
Chips	91	23	-	78	174
Chocolate candies	118	33	2	83	372
Non chocolate candies	91	24	4	63	187
Cookies	147	34	1	112	337
Crackers	38	6	1	31	69
Dairy substitutes	5	3	-	2	8
Other dairy case (non-bev)	9	6	1	2	17
Desserts	38	13	1	24	93
Special diet foods	30	9	-	21	56
Entree mixes	16	7	1	8	38
Fish	5	18	-	33	152
Fruits	32	6	2	24	197
Ice cream and cones	116	38	8	80	435
Jams, jellies, marmalades	75	26	2	47	271
Margarine, butter, etc.	18	5	1	12	22
Mayonnaise (inc. imitation)	14	2	-	12	30
Meals & entrees	121	53	5	63	336
Meat meals & entrees	33	7	1	25	98
Fish meals & entrees	16	5	1	10	109
Poultry meals & entrees	24	4	1	19	66
Vegetable meals & entrees	16	2	2	12	44
Meat	83	20	1	62	168
Miscellaneous foods	1	-	-	1	1
Mustard	46	13	2	31	112
Non-stick surfacing products	2	-	-	2	2
Nut butters	16	5	2	9	60
Oil and shortening	29	7	-	22	57
Pasta products & combinations	74	[illegible]	2	48	195
Pastry & baked products	99	7	1	61	250
Pickles, relishes, etc.	75	9	1	65	172
Popcorn	58	15	1	42	109
Poultry	48	13	-	35	151
Prepared salads	10	6	-	4	26
Rice & combinations	33	10	1	22	81
Salad dressings	68	22	2	64	167
Salad toppings & dips	21	6	1	14	58
Spaghetti, pasta sauces	43	16	1	26	90
Other sauces, gravies	152	41	2	109	346
Savoury spreads	6	1	-	5	20
Snack bars	22	8	1	13	50
Other snacks	106	30	1	75	247
Soup	70	27	3	40	195
Spices, seasonings, extracts	129	37	6	86	374
Staples	25	8	-	17	42
Sweet toppings	57	18	3	36	161
Vegetable protein products	27	11	1	15	78
Vegetables	92	17	4	71	197
Yogurt (inc. imitations)	31	10	-	21	112
Beverages					
Other alcohol	29	14	2	13	45
Alcohol subs, low alcohol	12	3	-	9	26
Baby beverages	2	-	1	1	7
Beer & ale	61	20	1	40	85
Beverage mixes & bases	29	9	-	20	50
Cocktail mixes	10	2	-	8	17
Coffee	43	15	1	27	119
Fruit & fruit flavored	125	35	2	88	400
Health drinks	11	3	1	7	21
Isotonic, energy producing	15	4	1	10	42
Liqueurs	26	8	1	17	35
Milk & non-dairy milk	39	16	-	23	89
Milk additives	3	-	-	3	6
Mineral, bottled water	53	18	-	35	157
Miscellaneous soft drinks	61	22	1	38	200
Tea	59	18	5	36	196
Vegetable, veg. flavored	8	-	-	8	19
Wine, wine coolers	64	17	-	47	97
	3581	1038	99	2444	8967

Source: Productscan™/Marketing Intelligence Service

Competition for market share of prepared food items has always been tough. The bad news is it's becoming tougher. The good news is that with a current sound economy and more households with dual earners, the demand for further processed, value-added foods is climbing at an astounding rate.

First, though, let's examine the bad news. Despite warnings that too many new foods continue to be introduced, the rate continues to soar. Marketing Intelligence Services Ltd., Naples, NY, tracked 3,581 new foods and beverages for 1987 – the largest number yet for a given year. While many of these are line extensions (see accompanying chart), supermarket shelf space to accommodate them is becoming increasingly difficult to come by.

It can cost a food company $2 to $3 million to coax stores across the country to stock a new product, according to Keith Jones a vice president of Summa Group, Stamford, CT, part of A.C. Nielsen Co. And as new software allowing accurate and rapid grocery store scanning data collection continues to become available, supermarkets can scrutinize even more closely how new products perform.

Another challenge faced by food manufacturers is increased competition from supermarkets themselves. As convenience foods play an even greater role in the lives of working women, single member households, and others who are looking to reduce food preparation time, supermarkets are responding by offering their own prepared foods. Twenty-six percent of chain supermarkets with annual sales over $2 million now have salad, soup or taco bars, and 81 percent have delicatessens, reports Nielsen Marketing Research, Northbrook, IL.

These in-store delicatessens and other supermarket prepared food areas are competing directly with processors' prepared entrees. The area which seems to be suffering the most is refrigerated entrees – especially since there is a limit to how much Americans will pay for prepared foods.

This can be seen in the demise of a line of refrigerated entrees offering individually packaged entrees, vegetables, side dishes, and desserts. In April of 1987, Milwaukee, WI-based Ember Brands introduced *Tonight's Choice* after extensive consumer research showing that the product appealed to people who then relied on fast food stores, restaurant take-out, and frozen dinners for quick evening meals at home. It was rolled out into upscale supermarket chains in Salt Lake City, Los Angeles, St. Louis, Milwaukee, and 14 other markets nationwide. Suggested retail prices for Tonight's Choice entrees ranged from $2.59 to $3.49; vegetables from $1.29 to $1.49; side dishes from $1.09 to $2.29; and desserts from $.79 to $.99; or $5.79 to $8.29 for a complete meal.

And General Foods, White Plains, NY, announced it was introducing less expensive entrees in its refrigerated line – *Culinova* – which is being test marketed in the New York metropolitan area. The line extensions, including items such as *Chicken in Barbecue Sauce* and *Lasagne Vitello*, will retail for $2.90 to $4.00 vs. $4.50 to $8.50 for the original line which includes entrees such as *Filet Mignon Madagascar*. While most Americans are turning to upscale foods more, they strongly hold to a price/value relationship.

Still, for all these difficulties many food manufacturers are continually developing and marketing successful new foods by closely monitoring consumer trends and anticipating consumers needs. The key is getting products on the market in "hot" categories before the category becomes saturated and profit margins go down.

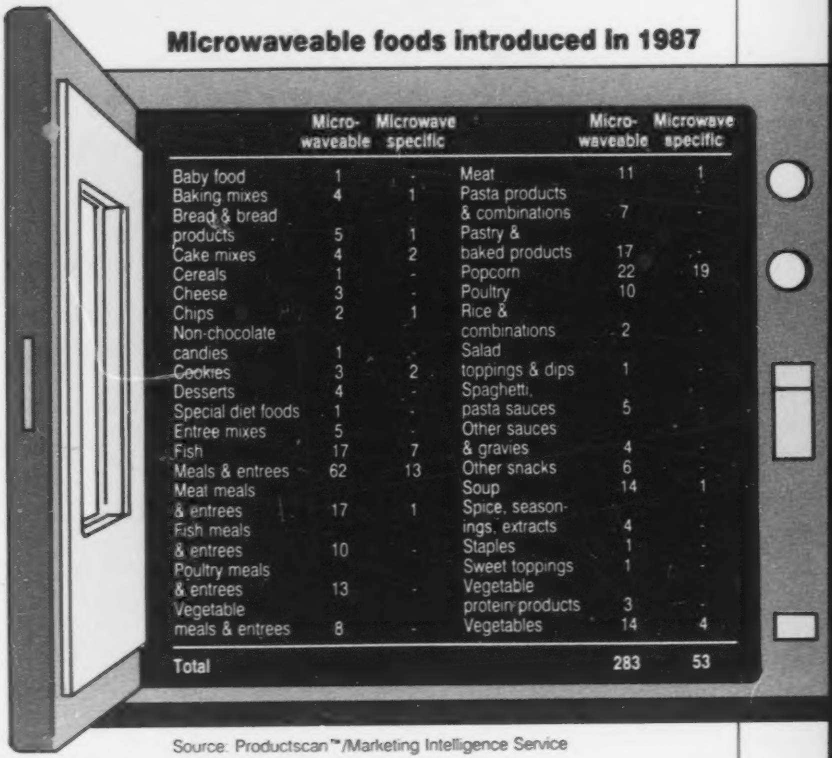
For example, by spring of last year the upscale frozen novelty category, once very lucrative, was already becoming saturated (see *FE*, July, 1987, p.23). Since then, Schamitoff was sold shortly after it introduced several new items, including *Liqueur Truffles*. The main reason given for selling that was the frozen market has become so competitive that profits for retailers have fallen to about half of what they were several years ago.

Certain trends, though, such as convenience will be around for a while. The U.S. Department of Labor predicts that by 1990, 76 percent of people aged 25 to 44 will be working outside the home. Young professional and "empty nesters" are also prime candidates for convenience foods.

But much of the future growth in this area will come from products offering improvements to what's currently available at a price in line with perceived consumer value. Last December 15, an article in the the *Wall Street Journal* pointed out that a surprising number of companies missed the signs of midlife crisis for the premium frozen entree category. Stouffer's Lean Cuisine has suffered a 20 percent drop in market share since 1985 as consumers are turning towards less expensive, less "gourmet" when purchasing prepared meals.

Growth in the frozen entree category will come from products using technological advances such as controlled atmosphere packaging for shelf-stable entrees or reformulating hamburger buns to be heated in a microwave oven (see the microwave-specific section of this article on page 94).

Microwaveable foods introduced in 1987



	Micro-waveable	Microwave specific
Baby food	1	-
Baking mixes	4	1
Bread & bread products	5	1
Cake mixes	4	2
Cereals	1	-
Cheese	3	-
Chips	2	1
Non-chocolate candies	1	-
Cookies	3	2
Desserts	4	-
Special diet foods	1	-
Entree mixes	5	-
Fish	17	7
Meals & entrees	62	13
Meat meals & entrees	17	1
Fish meals & entrees	10	-
Poultry meals & entrees	13	-
Vegetable meals & entrees	8	-
Meat	11	1
Pasta products & combinations	7	-
Pastry & baked products	17	-
Popcorn	22	19
Poultry	10	-
Rice & combinations	2	-
Salad toppings & dips	1	-
Spaghetti, pasta sauces	5	-
Other sauces & gravies	4	-
Other snacks	6	-
Soup	14	1
Spice, seasonings, extracts	4	-
Staples	1	-
Sweet toppings	1	-
Vegetable protein products	3	-
Vegetables	14	4
Total	**283**	**53**

Source: Productscan™/Marketing Intelligence Service

The Food Marketing Institute (FMI) asked consumers what the top new products in supermarkets were. For 1987, "food products designed especially for microwave cooking" were mentioned most often – by 89 percent of those surveyed. Tied for third place were "partially prepared foods that require less time to prepare at home" and "delicatessen or other carry-out food items" which were each mentioned by 78 percent of those questioned. (Generic products were mentioned second most.)

Convenience was identified by *FE* as a major driving force behind new food introductions in 1986 – it *is* the major driving force in 1987. Other factors influencing "hot" new foods in 1987 were health concerns (if they don't interfere too much with taste), taste, and value/quality relationship.

The major areas of new product activity that *Food Engineering* has identified for 1987 were: Microwave-specific, Cajun & other ethnic; sauces; pasta & rice products; bottled water, seltzers & other carbonated beverages; fiber- & calcium-added products; and yogurt & yogurt-like products.

One final note before getting into the individual categories. As food companies are becoming more marketing driven, not only are the types of new products being closely evaluated but so are marketing methods.

Regional marketing is becoming more common among food companies. Both General Foods and Campbell Soup have instituted regional marketing programs.

Larry Carpenter, director of marketing for condensed soups at Campbell Soup Co. pointed out in an article in the November 1987 issue of *American Demographics* that while developing regional products is expensive, the benefits are there. These include forcing national marketers to think like their local competitors, and enabling them to compete in new areas. It can also mean growth in mature or declining markets.

Marketing departments at food companies are also looking closely at age demographics. The Food Institute has published a report, *Demographic Directions For Food Marketing*. The report notes that per-person spend-

Blurring of lines between fast food & retail sales

White Castle—a well-known Midwest fast food chain offering miniature sandwiches—began test marketing a frozen, microwaveable version of its tiny square hamburgers and cheeseburgers last year. Going the other direction, J.R. Simplot Co.—which benefited tremendously from supplying frozen french fries to McDonald's and Burger King—is now competing with those chains by testing frozen, microwaveable hamburgers, cheeseburgers, and other products. And to confuse matters even more, taco bars, salad bars, and even breakfast bars are becoming more prevalent in supermarkets.

With eight out of ten households buying take-out food in any month (according to a study sponsored jointly by the Food Marketing Institute and Campbell Soup Co.), the battle over the dollars spent on take-out foods is intensifying. Successful fast food items are finding their way to supermarket shelves (see section on microwave-specific foods) and fast food outlets are expanding their menus.

Currently supermarkets trail behind restaurants as being recognized as a location to purchase take-out foods, according to the FMI/Campbell Soup study. The study, based on interviews with 614 households, found that only 18 percent of those asked to name the places that come to mind when they think of purchasing take-out food mentioned supermarkets. In contrast, 85 percent of the respondents named fast food restaurants; 65 percent, pizzarias; 35 percent, ethnic restaurants; 20 percent, independent delis; 7 percent, convenience stores; 3 percent, small grocery stores; and 2 percent mentioned gourmet stores.

The study also discovered that Americans who purchase take-out foods spend an average of $16.50/week on take-out foods—or $13.50 when non-users are averaged in. Thus, for the 88.5 million U.S. households, these figures project to about $1.2 billion spent weekly, or $62.4 billion annually.

This battle between fast food establishments and supermarkets for an increased share of the money spent by consumers on take-out food can be difficult to measure. The U.S. Department of Agriculture tracks the percent of disposable income spent on food eaten at home and of food eaten away from home, but take-out food purchased from grocery stores is included in food eaten at home. The USDA's figures show that 10 percent of disposable income in 1986 was spent on food eaten at home and 4.7 percent for food eaten away from home, in 1984 the figures were 10.6 and 4.6, respectively. (The 1987 figures will not be available until August or September, 1988.)

"As microwave oven penetration continues to grow throughout the '80s and into the '90s, the real battle in the fast food industry will not be McDonald's versus Burger King versus Wendy's, but will be more along the line of fast food chains versus packaged goods manufacturers and supermarkets," says Tom Vierhile of Marketing Intelligence Service.

The decreasing percent of disposable income spent for food eaten at home (including take-out food purchased in grocery stores) is in part responsible for the increasing number of traditional "fast food" items appearing on supermarkets shelves. (Currently, 30 percent of those consumers questioned in a 1987 Gallup annual report on eating out said that hamburgers were their favorite takeout food.) But, foodservice establishment are not standing passively by.

Carl S. Dienst, spokesman for Carnation Co., Los Angeles, CA, told those in attendance at last fall's R&D Associates meeting, "The fast food segment is a mature area in the midst of a shakeout. At the same time, it faces severe competition from newer, developing channels of food service." Dienst went on to review consumer trends and menu changes in the fast food industry that those trends dictate.

"Spicy and ethnic food trends continue to be leaders in new menu concepts," said Dienst. "The primary growth areas are Oriental, Mexican and Italian. As these restaurant segments grow, there is increasing pressure on fast food operators to add their own version of these foods." McDonalds has taken advantage of this growth with a successful promotion of Shanghai McNuggets in 1986, and in 1987 it offered Fiesta McNuggets.

Dienst also identified healthy and fresh/freshly prepared as the predominant trend, with finger foods as another contender. An example of the finger food trend is *Bundles*—one-ounce cheeseburgers that come three and six to a box—which were used by Burger King as a promotional item in 1987.

The increased concern for healthy foods could change consumers' view of supermarkets as important locations to obtain take-out food. The FMI/Campbell Soup study found that respondents perceived supermarket take-out as fresher, higher quality, healthier, more nutritious, and offering more value than restaurant take-out food. On the other hand, supermarket take-out food is not viewed as being as tasty or as much fun to eat as restaurant take-out food.

ing for food at home rises with age, up to the oldest group (above 75). This, along with the fact that the population is aging, leads to the recommendation that "careful targeting of markets will be required for success (or even survival) in such an environment – better understanding of how age change will affect consumer spending takes on a new sense of urgency."

Pillsbury Co. conducted a series of market research focus groups with consumers between the ages of 50 and 60. The company's associate director of marketing mesearch, Robert M. Anderson cautioned, "Very careful communication is the key to success with these consumers. They are receptive to products offerings which cater to their needs, but be careful to avoid messages which suggest that they are now getting old and need to change their eating habits."

Now for the specific categories. Once again many of the new foods introduced in 1987 fall into several categories – increasing their appeal to consumers. For example, many of the popular new sauces also have an ethnic flair.

'Microwave-specific'

By the end of 1987, microwave ovens were in at least three-fourths of the homes in America. This is the latest estimate from the Association of Home Appliance Manufacturers (AHAM). And in a survey conducted by the Good Housekeeping Institute for AHAM, almost half of those questioned use their microwave oven often for cooking frozen foods, and 38.7 percent use it often for cooking nonfrozen foods.

This escalation of microwave oven use is having a dramatic effect on the prepared foods industry. Americans spent $760 million on microwaveable foods last year, up 64 percent from 1986, according to SAMI/Burke Inc.

Two things happened in the microwave-specific category this year. Popcorn continued to dominate the category, but other segments also began to pop. About half of the sales are generated by popcorn, according to New York City-based SAMI/Burke Inc.

Developed for microwave preparation, the MicroMagic line of hamburgers, milk shakes, and other items was first introduced in 1987. Photo courtesy of J.R. Simplot.

MicroMagic

Some of the new microwaveable popcorn products to appear on supermarket shelves last year were three new varieties of *Orville Redenbacher's Gourmet Microwave Popping Corn* – Butter, Sour Cream'n Onion, and Cheddar Cheese. Each is sold in a 10.5 ounce box containing three bags of popping corn. The butter variety was introduced in the early part of the year, and the other two towards the end of the year.

Still, regardless of popcorn's dominance, 1987 was the year when roughly 60 percent of the category introductions were in other areas. There was an explosion.

The leader in the microwave-specific food category is Pillsbury. *Business Week* (April 27, 1987) reported that for fiscal 1987 year revenues from microwave-only foods at Pillsbury would be $150 million, up from $60 million two years previously. The company's 1987 microwaveable-only introductions were:

- January: *Van de Kamp's Lightly Breaded Microwave Fish Fillets*. The fish is coated with a special breading designed to be crispy after microwave preparation, and a susceptor is included in the package.
- October: *Green Giant Garden Gourmet Frozen Vegetable Dishes*. Developed exclusively for microwave preparation, these dishes feature vegetables combined with either rice or pasta and a sauce.
- August: *Microwave Brownie mix* made its debut. In September, a frosting for hot microwave cakes – *Frost It Hot* – was announced. And in November: A complete line of desserts joined these products, including *Tunnel of Fudge Bundt Microwave Cake Mix, Streusel Swirl Microwave Cake Mix, Double Chocolate Cake Mix, and Double Lemon Supreme Cake Mix*. All the mixes were specifically developed for microwave baking, and have a reusable microwave pan.

Pillsbury, though, was not the only company to introduce microwave-specific desserts last year. ConAgra Frozen Foods, Ballwin, MO, added *Morton Fruit Pies*, specially designed for preparation in microwave ovens, to its line of *Great Little Desserts*. The 6.5 ounce pies are single-serve and come in apple, cherry, and peach varieties. Preparation time is 7 to 8 minutes in the microwave or 45 minutes in a conventional oven.

"We know that there is a growing demand for single-serving products...and we know that consumers want more products that work well in the microwave. Our new fruit

NEW PRODUCT ANALYSIS

Food introductions 1987

Use of national and ethnic descriptors

	Frequency		Frequency
Austrian	4	Indian	8
Australian	3	Irish	11
Cajun	90	Italian	100
Chinese	19	Japanese	17
Creole	34	Jewish	42
Danish	10	Mexican	44
Dutch	11	Oriental	46
European	14	Polish	6
French	109	Russian	2
German	8	Swedish	6
Hispanic/Spanish	33	Swiss	7
Total Food Introductions	**2931**		

Source: Productscan™/Marketing Intelligence Service

pies meet both those needs," said Jeff Jury, Morton Product Manager, in announcing the pies' introduction last November.

Many of the problems that in the past detracted from the quality of foods prepared in the microwave have been tackled in formulating the latest microwave-specific food. The newest products in this area are traditional American foods targeted at mid-America.

Two years of intensive development went into overcoming problems such as excessive moisture that promotes sogginess, uneven heating, and lack of adequate browning prior to Oscar Mayer's introduction of *Zappetites* microwave-exclusive frozen foods. In fact, many of the solutions to develop products such as chicken nuggets, hot dogs, pizza, and cheeseburgers that can cook in about 60 seconds come out of technology within the Oscar Mayer/General Foods organization.

The Ham and Cheese Stuffed Sandwich, for example, uses a special fiberboard tray that creates air space between the product and the package, and "wicks" the moisture away from the sandwich so the crust will remain flaky. The dough for this sandwich was created to be moisture-resistant by developing a formulation that uses a specific type of starch, and a precise ratio of starch to fat to flour. Patents have been applied for many of the processes developed.

Competing directly with fast food restaurants is *MicroMagic*—a frozen line of Hamburgers, Cheeseburgers, French Fries, and Hash Brown Sticks developed exclusively for microwave preparations. Hailing from Boise, ID-based J.R. Simplot Co. these items were introduced in 1987. A Chicken Sandwich and three flavors of Milkshakes were added to the line early this year.

"The line brings to retail stores popular fun foods which have a consumer franchise in non-supermarket channels," noted Blaine Jacobson, retail marketing manager of Simplot's food division.

MicroMagic is currently in 60 percent of the country, and the company is encouraged by the line's success so far. The hamburgers are 100 percent beef on a sesame seed bun. Three three-ounce hamburgers come in a package that retails for $1.19.

Almost in national distribution (excluding only Philadelphia and metropolitan NY), *Microwave Hamburgers, Cheeseburgers,* and *Bacon Cheeseburger* were added to Hormel's *New Traditions* line of microwaveable products in 1987. The response for them has been tremendous, according to Tom Bloomhart, a company spokesman.

The New Traditions line was begun by introducing microwaveable sausage, then six breakfast sandwiches were added to the line. Expanded distribution of the original items took place in February of 1987, with the burgers being added from mid- to late 1987. The success of the line has prompted further expansion with fish fillet and breast of chicken sandwiches being added this year.

The hamburger patties are precooked, and the buns were specifically formulated not to get tough during microwave preparation. The hamburger products, in fact, have been the most often purchased of the New Traditional items. This is due, in part, to hamburger being a more popular concept, says Bloomhart. He added that they have solidly outperformed all their competitors in markets where there is competition.

A little different angle to traditional American fare that can be prepared quickly hails from the Campbell Soup Co. The company began test marketing *Souper Combo*—a line of eight frozen microwave-only meals—last November in Chicago. One of the reasons Chicago was selected was that food taste there are "All American" (mainstream).

"The line pairs some of America's favorite foods with popular soups for lunch, dinner or snack," said William McLaughlin, Souper Combo brand manager. "Our market research showed that the Souper Combo idea was well-received because of the nostalgia associated with a soup and sandwich meal along with the microwave convenience."

Varieties in the line include: Vegetable soup and Cheeseburger, Cream of Broccoli Soup and Ham and Swiss Cheese filled Croissant, and Chili with Beans and Hot Dog on a Bun. Each meal takes between 5-1/2 to 7 minutes to prepare.

Souper Combos are especially targeted at teenagers and for lunches eaten in the office. Seventy percent of people working have access to a microwave oven at their place of employment, according to a Campbell Soup study.

A number of microwaveable, shelf-stable entrees were introduced into this country by several major food companies last year. Although shelf-stable entrees have been popular in Europe for a number of years, the European versions are formulated mainly for stove-top cooking (with microwave directions included) since microwave oven penetration is so small in Europe. On the other hand, the U.S. shelf-stable entrees have been specifically formulated for microwave preparation.

One of these lines, *Impromptu* Prepared Dinners, is being tested by General Foods Corp., White Plains, NY, in the New York metropolitan area. And in January of 1987, Geo. A. Hormel & Co. announced the introduction of *Top Shelf*. Vacuum-packed in a multi-layered, plastic serving dish and sealed airtight with an easy-open lid, these entrees are pre-cooked by traditional thermo-processing.

Introduced in Denver and Indianapolis, the initial line consisted of: Italian Style Lasagna, Tender Beef Roast, Boneless Beef Ribs, Glazed Breast of Chicken, Breast of Chicken Acapulco, Chili Con Carne Suprema, Sweet and Sour Chicken, Lemon Fillet of Cod, Linguini with White Clam Sauce, and Spaghetti with Meat Sauce. Each entree can be prepared in a few minutes.

The company recommends placing these shelf-stable entrees in the aisle near dry pasta and spaghetti sauce products since, as one spokesman said, "We've identified this aisle as an area of the store where our target consumers – higher income adults ages 25 to 54 – already are shopping."

The Dial Corporation's latest new product is *Lunch Buckets* – a line of six soups and nine entrees which provide half-pound meals that go from shelf to microwave to table in 90 seconds. They have a shelf-life of up to two years.

Lunch Buckets were successfully test marketed in Colorado, Wisconsin and Virginia beginning in 1985, with results far exceeding expectations. The line was then introduced to about 20 percent of the country in April of 1987. It includes 15 varieties ranging from lasagna, beef stew and chili to chicken noodle soup and clam chowder. Prices vary from 99 cents to $1.29.

And with the penetration of microwave ovens into U.S. homes expected to reach 90 percent by 1990 the future looks bright for this category.

Cajun & other ethnic foods

Americans' expanding quest for adventure in eating has resulted in an explosion of Cajun foods on the market. With the first national lines introduced in 1986, the proliferation of new Cajun foods expanded in 1987 to the point where some supermarkets added Cajun food sections (although small ones) to the ethnic aisle that already contained Italian, Mexican, and Oriental sections.

Cajun foods caught on quickly with consumers, more so than Mexican foods initially did. This is due, in part, to the fact that middle America is traveling more. And New Orleans has become a popular location for business meetings.

A wide range of food categories now include Cajun foods – especially when 1987 introductions are taken into account. A major Cajun line introduced last year came from McCormick & Co., Inc., Hunt Valley, MD. By mid-February to early March, 1987, McCormick's *Classic American Foods* rolled out a line of spice blends and a line of cooking systems under the *Brennan's of New Orleans* brand.

The spice blend line includes seasonings for: vegetables, pork and veal; fish; shellfish; beef; and poultry. Containing suggestions for use, these seasonings blends were available on a limited basis in 1986.

The cooking systems are designed for specific applications which involve minimal preparation of three to four steps. Items in the line are: Mild Crispy Creole Chicken Coating; Shrimp Creole Sauce Mix; Creole Jambalaya Mix; Spicy Crispy Creole Chicken Coating Mix; Creole Rice; and Mardi Gras

Suzi Wan
Lipton
Rice Cajun-Style
LA CHOY
Chicken Teriyaki
crumpy
Spatini
Primavera
SOY

A wide range of ethnic-style foods were introduced last year, with the most popular type being Cajun/Creole products such as Lipton's Rice Cajun-Style.

Dip Mix.

The Brennan's of New Orleans line is available in the Baltimore/Washington D.C. area, Atlanta, New Orleans, New York, and parts of California and Texas. McCormick reports that the product has received good reception so far.

Other 1987 introductions of Cajun/Creole foods:

- In introducing *Ruffles Cajun Spice potato chips*, Dallas-based Frito-Lay stated that Cajun will find a niche because it is unlike any other kind of cooking.
- Del Monte USA, San Francisco, introduced *Cajun Style Stewed Tomatoes*, with black and cayenne pepper, cloves, green peppers, allspice, cinnamon, garlic, onions, and celery among the ingredients.
- *Chef Bailey's Cajun Butter* was introduced by Mid-America Dairymen Inc., Springfield, MO. The flavored butter comes in eight and three pound plastic tubs, and is distributed in Midwestern areas.
- Select Origins, Westhampton Beach, NY, has added *Cajun-Creole Dip Mix* to its line of dip mixes. Each box includes two cellophane pouches – one contains "Cajun Heal" or cayenne pepper so consumers can adjust the seasoning to the desired taste.
- *Cajun Hot & Spicy Beef Jerky* was made available from Nehring Farms of Wamego, KS.
- Cajun flavor is among the new varieties of Missoula, MT-based John R. Daily, Inc.'s *Flavored Bacon*.
- ConAgra, Inc., Omaha, NE, selected Cajun Style with White Pepper Cheese as one of the varieties for its new refrigerated *Country Pride's Fresh And Ready Chicken*.
- *Dingus McGee Cajun Catsup* was one of the 1987 introductions of Dingus McGee's Premium Food Products, Colfax, CA.
- A new 1987 variety of T.J. Lipton's *Rice & Sauce line* was *Rice Cajun-Style*. The dry mix product includes microwave directions.
- *Shredded Cheddar & Monterey Jack Cheese* with Cajun Seasonings was added to the Sargento Shredded Cheese line from Sargento Cheese Co., Plymouth, WI.
- St. Louis-based Pet Inc. expanded its *Cajun Cookin'* line by adding *Shrimp Jambalaya* during the first quarter of 1987.
- *Cajun Classics* – frozen entrees with less than 350 calories each – were new from L.A. Frey & Sons, Inc., Layfayette, LA.
- The New England Shrimp Company, Malden, MA, announced the availability of its *Cajun Style Spiced Peel N' Eat Shrimp*.

And this is only a sampling of the 90 Cajun and 34 Creole foods introduced last year as reported by Marketing Intelligence. But even through the majority of new ethnic foods were Cajun/Creole items, significant developments took place in other ethnic categories.

Business Trend Analysts (BTA), Commack, NY, in its recently released report, *The Ethnic Foods Market*, projects that by 1996 the overall market for ethnic foods will total $12.9 billion. This would represent an annual growth rate of 8.1 percent from its current level.

A large number of new foods last year were cited as being European-type (these included general European as well as specific country descriptors). For example, R.T. French Co., Rochester, NY, began marketing four varieties of *French's Sauce Mix* – *Bearnaise, Mornay, Provencale*, and *Bordelaise*.

The Kellogg Co., Battle Creek, MI, targeted American adults with *Mueslix* – an Americanized version of European muesli-style cereal. Available in bran and five-grain varieties, Kellogg spent $33 million on advertising and marketing, the greatest amount ever spent on a cereal introduction according to the manufacturer. The national TV campaign focuses on the cereal's European heritage.

Although a number of food processors are using European-style foods to give their products an upscale image, many of these foods are formulated for the American palate. In addition to Kellogg's Americanized version of muesli cereal, Knorr reformulated its dry mix sauces and soups prior to their most recent U.S. introduction. (CPC attempted to introduce imported Knorr soups and sauces during the 1970s and ended up pulling the product from the market.) Another new U.S. product with a European descriptor is *Dutch Chocolate Mint International Coffee* – the latest addition to this line

Food Introductions 1987
Sauces by type

	No. of Intros.
Spaghetti	20
BBQ	38
Pizza	4
Pasta	15
Seafood	19
Mexican	13
Tomato	23
Other	76

Source: Productscan™/Marketing Intelligence Service

COOK'S CLASSICS
MAGGIE GIN'S
5-SPICE SAUCE
MAGGIE GIN'S
MANDARIN SAUCE

A host of new sauces were seen at the 33rd Annual International Fancy Food & Confection Show held July 12 to 15, 1987 in New York City.

from General Foods.

While much of the excitement in new ethnic foods was in some of the segments which currently hold small market shares of the overall category, new trends were also seen within the traditional ethnic categories. There were moves toward regional cuisines within Italian, Hispanic, and Oriental categories.

A line of seven *All Purpose Sauces* were announced by Beatrice/Hunt Wesson, Inc., Fullerton, CA. Packaged under the *La Choy* name, they are: Hot & Spicy Szechwuan, Thick & Rich Teriyaki, Original Barbecue, Mandarin Orange, Original Sweet & Sour, Tangy Plum, and Sweet & Sour Duck Sauces.

Japanese sauces are also becoming more specialized. Kikkoman Corp., San Francisco, long known for its soy sauce, introduced *Kikkoman Sushi & Sashimi Soy Sauce*.

A new cuisine (at least new to most Americans) which holds the most promise as the next "hot" ethnic area in the U.S. is Caribbean. The Baltimore Spice Co., Baltimore, MD, confirms this by revealing that the number of request for Caribbean spice blends from food manufacturers is on the rise. Typical Caribbean spices are nutmeg, black pepper, onion, garlic, bay leaves, ginger, mace, parsley, thyme, and allspice, according to the American Spice Trade Association.

"Each new popular ethnic food category has been spicier than the last one," observes Austin Jacobus, marketing manager for The Baltimore Spice Co.

In August of last year, Campbell Soup Company announced the restaging of its Hispanic *Casera* brand with emphasis on Caribbean foods. Currently, the line is targeted at Hispanics (especially those of Puerto Rican decent) in metropolitan New York and Florida markets.

Long-term plans for this line a few years down the road, could include marketing the line to mainstream America. That would involve educating American consumers about Caribbean foods, pointed out David C. Hackney, spokesman for Campbell.

The new value-added products in the Casera line are prepared "Criollo style," containing Caribbean spices and sofrite – a condiment with a combination of sauteed ingredients and used in many Caribbean foods.

Other ethnic food categories which could have an increasing impact on Americans' diet are Thai – a cuisine characterized by spice foods with many red, gold, and orange hues – and Indian – both American and from India.

Sauces

While many of the sauces introduced in 1987 overlap into the ethnic category, the proliferation of sauces – both among major and small processors – last year warranted a separate coverage. Many of the sauce introductions go hand in hand with the expanding popularity of pasta.

Since 1980, sauce sales have grown at an annual average rate of 10.5 percent, reports BTA in its *Ethnic Foods Market* report. The report notes that spaghetti sauces are the largest category in the market, accounting for 88.1 percent of the $705 million sales. Non-tomato sauces follow with a 9.0 percent share.

U.S. consumption of spaghetti sauce has increased 7 percent annually over the past ten years, according to BTA. Among spaghetti sauce varieties, meatless sauce comprised 87.4 percent of sales, sauces with meat stood at 11.4 percent, and sauces with clams at 1.4 percent. BTA predicts that over the next decade sales of meatless sauces will grow at a rate of 8.1 percent averaged annually, sauces with meat at 1.2 percent, and clam sauces will decline 2.5 percent annually. BTA's report also predicts that sales of Italian sauces will reach $1.5 billion by 1996, but it won't be smooth sailing.

"The proliferation of brands and varieties has crowded shelves and confused consumers, while the turnover time of premium products is much slower than that of regular lines, exacerbating the shelf space problem," states BTA "This portends a shakeout in the near future at the expense of smaller, weaker brands."

Italian sauces tend to be more popular in the East where there is a more prevalent Italian population, points out Campbell Soup's Kathleen McDonald. Even so, Italian sauces like pesto and Alfredo are not the high volume movers that red sauces are—even in the East. But often supermarkets will carry a low volume, non-red sauce to round out a line of sauces.

The newest addition to Greenwich, CT-based Chesebrough-Pond's Ragu foodservice line of Italian Food Sauces is *Chunky Style Deluxe Spaghetti Sauce*. It includes diced tomatoes in juice, crushed tomatoes in puree, and tomato paste, with a mild blend of spices.

In the area of Mexican sauces, Geo. A. Hormel & Co., Austin, MN, announced an exclusive license agreement last year with Chi-Chi's, Inc. to market sauces and dips under the *Chi-Chi's* trademark. Included will be Salsas, Picante Sauces, Taco Sauces, Cheese Dip, and Bean Dip. Grand Rapids and Lansing, MI; Columbus, Dayton, and Cincinnati, OH; Kentucky; West Virginia; and Virginia were the markets selected for the line's introduction.

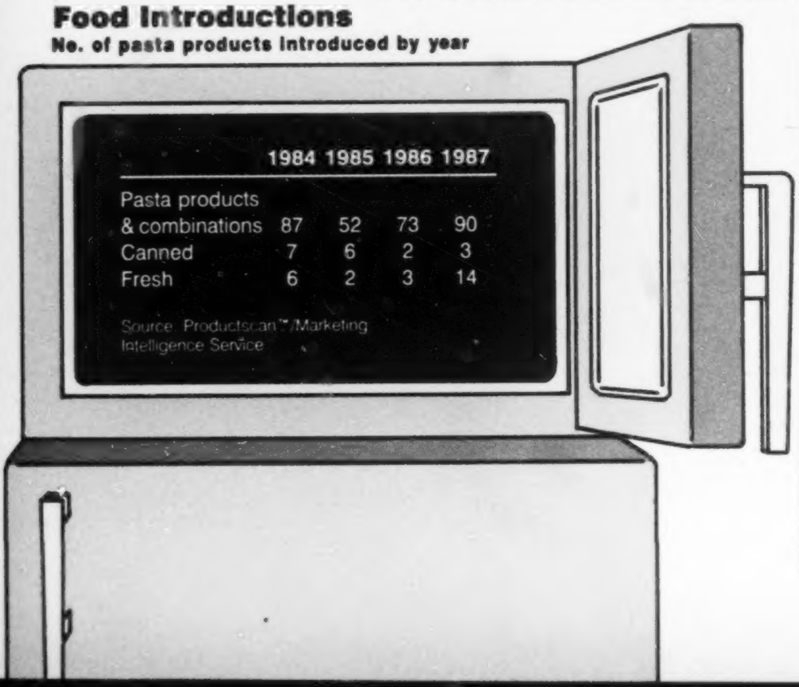
In the area of seafood sauces, Golden Dipt announced the availability of *Golden Dipt Ginger Teriyaki Seafood Marinade, Golden Dipt Classic Lemon Butter Dill Flavored Seafood Cooking Sauce,* and *Golden Dipt Lemon Herb Seafood Marinade.* They come in 12 ounce bottles and their prices range from $2.39 to $2.79.

A Quebec, Canada-based company, Les Produits Ronald Ltd., began introducing a fondue kit which included three sauces and bouillon for heating last year. *Chicken Fondue* includes *Mexican, Barbecue,* and *Tarragon Fondue Dips. Oriental, Seafood,* and *Chinese Fondue kits* are also offered.

All-purpose gourmet sauces were still another popular type of new sauce in 1987. Cook's Classics, Ltd., of Palo Alto, CA, added three new sauces to its line—*Tomato-Sesame, Golden Almond,* and *Garlic Lover's Herb.* They are recommended for use directly from the jar onto a variety of foods such as pasta, meats or fish, vegetables and sandwiches, or as basting sauces.

Food Introductions

No. of pasta products introduced by year



	1984	1985	1986	1987
Pasta products & combinations	87	52	73	90
Canned	7	6	2	3
Fresh	6	2	3	14

Source: Productscan™/Marketing Intelligence Service

Golden Almond Sauce is a low-sodium, non-dairy alternative to hollandaise. The Tomato-Sesame sauce blends tomato bits, cumin, sesame oil, and sesame seeds with other herbs. A free recipe folder is offered.

All-purpose sauces were introduced by Sierra Vista Corp., Orinda, CA. *Original Red, Spicy Hot Red,* and *Green Marinada* were the varieties offered.

Many of the new sauces came from small, specialty companies, and are available only on a regional basis. Often the more unique flavors originate with these smaller companies. But as the public embraces these newer flavors, large companies may develop versions of them for mass marketing.

Les Amis Gourmands Perel Co., a Tiburon, CA-based sauce manufacturer, showed a line of unique sauces including *Cuisine Perel Hot Thai Peanut Dressing* at last year's Annual International Fancy Food & Confection Show in New York City. Silvia Perel, one of the founders of Les Amis Gourmands, told *FE* that people from several major companies had come by their booth and said they were looking for new sauce ideas.

The sauce category lends itself to creative new products, and as the U.S. consumer continues to become more adventuresome in eating, this category will benefit. Another attraction of the sauce category is that while a prepared sauce can reduce preparation time considerably over making one from scratch, the final product still has a "homemade" image—at least much more so than a frozen entree that has been heated.

Pasta & rice products

Once ownership of pasta companies was spread out among a host of family-owned businesses. But with Borden's purchase of Prince—the last of the big family owned pasta companies—four firms now control three-fourths of the U.S. dry pasta market. Of the four firms—Borden, Hershey, Best Foods' Muellers, and General Foods' Ronzoni—Bordon is the leader with its 1987 pasta sales of about $415 million. But both large and small companies are actively introducing new pasta products.

New pasta introductions range from dry-packaged to refrigerated to frozen; and from new shapes and colors of pasta to further value-added products such as pasta salads. The versatility of pasta is contributing to its current growth as a category.

"As pasta grows in popularity as a main dish, it is becoming a trendy, upscale food," said Hugh Peters, Mueller's brand manager. "Because of this, consumers are continually seeking variety and creative new recipe ideas."

Plain egg noodles and traditional spaghetti are making way for more innovative pasta products. Growing popularity of ethnic foods and concern for more healthy eating have both contributed to the increasing use of pasta and rice dishes.

Ethnic variety can been seen in three new varieties of noodles and broth offered under the new *Japan Bowl* line: *Udon Noodles and Broth* is made with Japanese flat noodles and a mild broth mix; *Soba Noodles and Broth* includes Japanese buckwheat noodles; and Japanese extra fine wheat noodles are used in *Somen Noodles and Broth*. Each comes in a 6.5 ounce package, with a wrapper featuring the line's green and bamboo border. China Bowl Trading Co., Inc., Parsippany, NJ, markets the product.

The increase in pasta and rice dishes is not just in the area of "ethnic" pasta dishes. New product introductions in the overall category are growing. Marketing Intelligence Service reported 74 new pasta products and combinations in 1987 and 33 new rice and combinations as compared to 64 and 29, respectively, for 1986.

One of America's oldest pasta manufacturers, A. Zerega's Sons, Inc., Fair Lawn, NJ, introduced several new dry pasta products in 1987. In September, the company announced the addition of four items to its line of *Antoine's* pasta. *Antoine's Paglia e Fiena* (straw and hay) is a combination of spinach and egg fettuccine. *Penne Rigate* (pens or feathers) are diagonally cut tubes that are ridged to help hold the sauce. *Antoine's Spicy Spirals* are pasta twists made with tomato, basil, and cayenne. And *Fusilli Tri Colori* is a medley of spinach, tomato, and semolina pasta with a unique corkscrew shape.

A. Zerega's Sons also introduced a *High Fiber Pasta* as an ingredient for prepared foods last year. This pasta has six grams of total dietary fiber per two ounce serving (dry

Mueller's
NEW VARIETY!
SALAD BAR PASTA
Pasta and Seasoning Mix
VINAIGRETTE
NET WT 5.9 OZ
MAKES 6 (½ CUP) SERVINGS
Mueller's
NEW VARIETY!
SALAD BAR PASTA
Pasta and Seasoning Mix
CREAMY GARDEN
NET WT 6.0 OZ
Mueller's
NEW VARIETY!
SALAD BAR PASTA
Pasta and Seasoning Mix
CLASSIC HERB
Mueller's
NEW VARIETY!
SALAD BAR PASTA
Pasta and Seasoning Mix
COUNTRY RANCH WITH BACON

Last month Best Foods added four items to its successful Mueller Salad Bar Pasta line which was originally introduced during 1987. Photo courtesy of Best Foods.

weight) compared to less than one gram per serving of regular pasta. It is made with enriched durum semolina, refined corn bran, and egg whites.

New shaped pasta also was introduced last year by The Silver Palate, New York, NY. *Palate Pasta* comes in four shapes and flavors—*Fusilli Trio, Spinach Bow Ties, Little Red Basil Wagon Wheels,* and *Spinach and Semolina Radiatore*. All the new pastas are made with North Dakota durum and semolina flour.

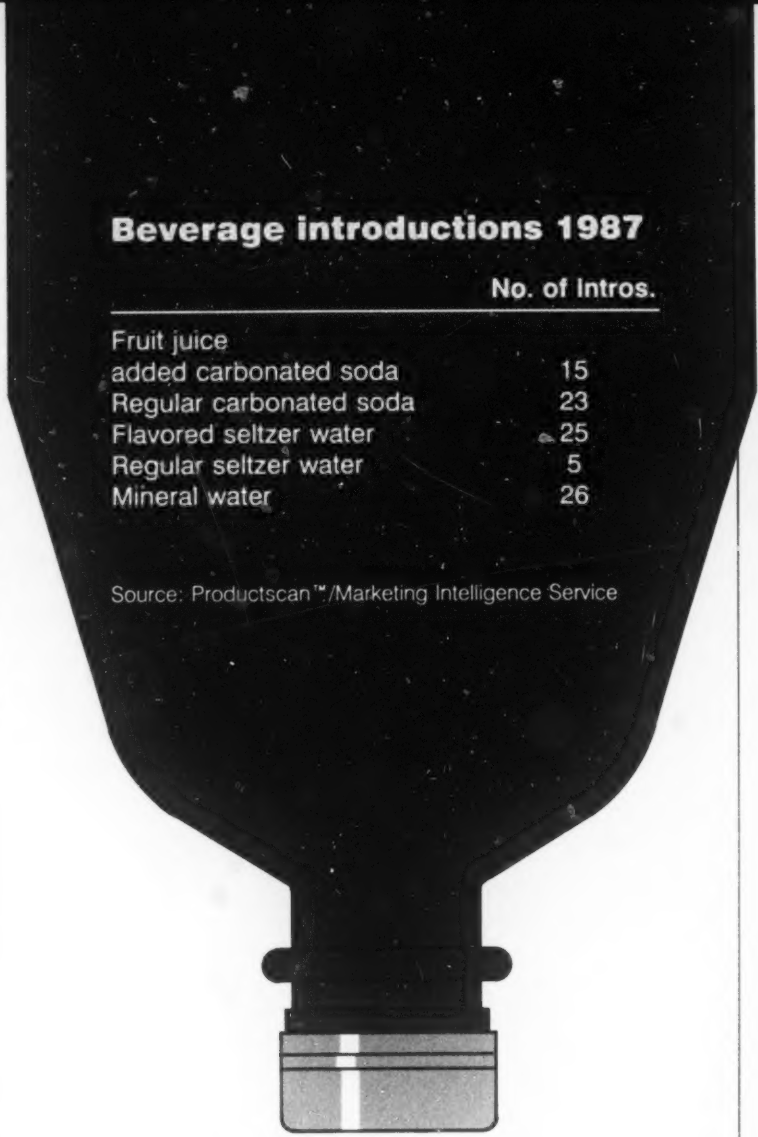
Imports were another source of new pasta products last year. For example, 3 Glocken GmbH, Weinhiem, W. Germany, displayed *Black Forest Girl* Egg Noodles and *Noodlemaster* Egg Noodles. These products are advertised as high quality since the Noodlemaster Egg Noodles contain 12 egg yolks per 35.3 ounce and are made without water. They are made with American durum wheat.

In the further value-added area, pasta- and rice-based dry packaged dinners are joining macaroni and cheese products in the $894 million dry-packaged dinner category. In the spring of last year. General Mills expanded its *Betty Crocker* line of *Suddenly Salad* (see *FE*, April, 1987, p.79) nationally. And several other food manufacturers introduced competing lines.

Englewood Cliffs, NJ-based Best Foods announced the introduction of *Mueller's Salad Bar Pasta* in April, 1987. In making the introduction, Mike Lebo, New Products Manager at Best Foods, said, "Today's consumers want a greater selection of side dishes to choose from, more than just the standard rice and potatoes. And with Americans eating more pasta than ever—it's only natural America's oldest pasta company enter this growing segment of the market."

Originally the Salad Bar Pasta line included five varieties—Creamy Italian, Zesty Italian, Homestyle, Creamy Cucumber, and Country Buttermilk. Depending on the variety, oil or mayonnaise is added to the provided seasoning mix and blended with the pasta. Available in a six-ounce package, each makes six servings. The product retails for approximately $1.09 and is available in selected markets in the Midwest, East, South, and in California. In March of this year, Vinaigrette, Classic Herb, Creamy Garden, and Country Ranch with Bacon varieties were added to the Pasta Bar Salad line.

Yet another new pasta salad dry mix to be introduced last year was *Cool Side Salads* from Lipton. The growing consumption of prepared salads during the 1980s was a major factor in Lipton's decision to develop this line which can be prepared in under 12 minutes, less time than it takes to drive to the deli and considerably less time than it takes to make a homemade salad.



Beverage introductions 1987

	No. of Intros.
Fruit juice added carbonated soda	15
Regular carbonated soda	23
Flavored seltzer water	25
Regular seltzer water	5
Mineral water	26

Source: Productscan™/Marketing Intelligence Service

Cool Side Salads come in four varieties—Robust Italian, Garden Herb Rice Salad, Creamy Italian, and Creamy Buttermilk.

New rice dishes are also offering increased variety—some with health-type recipes included. Riviana Foods, Inc., Houston, TX, introduced a new line of *Mahatma Seasoned Rice Mixes* last year. Each of the five flavors—Saffron Yellow, Almond Beef, Sesame Chicken, Authentic Spanish, and Wild Rice with Seasonings—can either be prepared according to package directions or recipes that have been developed by the Riviana Kitchens to add "extra pizazz." The recipes include Conquistador Spinach Salad with Lemon Dressing; Chicken 'n Rice Louisianne; and Sesame Chicken Egg Fu Yung.

The freezer case is also seeing it's share of new pasta dishes. *Quick Cuisine Gourmet*

NEW PRODUCT ANALYSIS

Pasta Salad Meals—a five-item line from Oregon Farms, Eugene, OR, was introduced during the last quarter of 1987. The frozen "cold pasta dishes" can be prepared in three minutes—no heating is necessary. Cheese & Pasta Italiano with Vinaigrette Dressing, Pasta & Chicken Classic with Zesty Pesto Dressing, Seafood & Pasta Classic with Creamy Dill Dressing, Shrimp & Pasta Delight with Tangy Louie Dressing, and Pasta & Ham Julienne with Vinaigrette Dressing are offered.

Earlier in the year, The Pillsbury Company announced the introduction of its newest side dish—*Pasta Accents*—under the Green Giant label. The new line comes in 16-ounce polybags and can be prepared on the stovetop or in a microwave oven. Flavors in the Pasta Accents line include: Lemon Butter, Parmesan Cheese, Cheddar Cheese, Sour Cream and Herb, Garlic, and Southwestern Style.

Pillsbury reports that pasta is a $2.4 billion market that has seen 33 percent growth over the last four years.

The last area where pasta dishes are being introduced is in the refrigerated section. General Foods Corp., introduced *Ronzoni* refrigerated pastas and sauces into test market in Cincinnati, OH. And Los Angeles-based Carnation Co. introduced a line of refrigerated pastas and sauces under its *Contadina* brand. *Fresh Pasta & Cheese* is available on the East and West Coasts and in Chicago.

Americans' interest in keeping variety in their foods with a minimum of preparation will keep this a healthy category.

New entries into the bottled water (sparkling, still, etc.) and seltzer categories found tough competition and disagreements as to defining segments in the category.

2/$1.00
Seltzer
Schweppes
SELTZER
Poland Spring
2/$1.00
Seltzer

Bottled water, seltzers and other carbonated drinks

Alcoholic beverage consumption in restaurants is declining; wine cooler shipments began declining last year; but the $37 billion soft drink industry remains strong. Hot items within the soft drink category in 1987 were bottled water (mineral, sparkling, etc.) and seltzers. The National Restaurant Association reports that the number of customers ordering bottled water at tableservice restaurants has quadrupled since 1980. And the $260 million of seltzer sales in 1986 were expected to double in 1987.

SAMI/Burke Inc. shows some impressive growth in this area. Sales for sparkling flavored water was $26.6 million in 1987, or a 65.1 percent increase over the previous year. (This does not include Seltzer delivered directly to the stores.) Sales for mineral flavored water in 1987 was $29.8 million, a 43.9 percent increase over 1986. And mineral water sales rose 57.3 percent between 1986 and 1987 to reach $4.0 million. The sparkling unflavored water category showed a lower increase of 14.4 percent growth for the same time period.

Along with climbing sales of bottled waters and seltzers has come controversy, though. Two of the early players were the Original New York Seltzer Co., Walnut Creek, CA, and American Natural Beverage Corp., the New York-based marketers of Soho seltzer.

Problems began after Anheuser-Busch, St. Louis, began testing *Zeltzer Seltzer* in February of 1987. American Natural sued A-B, claiming that Zeltzer imitated Soho's package design and A-B filed a countersuit stating that American Natural executives had made remarks that defamed them. The dispute was settled out of court. Recently A-B redesigned Zeltzer's packaging.

The next controversy occurred when Chicago-based A.J. Canfield Co., a Canada Dry bottler, filed a complaint with the Food & Drug Administration that Zeltzer, Soho, and other seltzers were mislabeled since they were sweetened and flavored. The FDA ruled last summer that sweetened seltzers must be prominently identified as "soda" on the label but the "soda" does not need to appear in the brand name or in advertising.

Zeltzer Seltzer, described as an all-natural soda made with plain, carbonated seltzer, natural flavors and sweetener, was initially introduced in California, Texas, Arizona, Chicago, and St. Louis. It is now available in 43 states and the District of Columbia. It is offered in seven flavors: Raspberry, Peach, Blueberry, Cola & Berry, Black Cherry, Vanilla Creme, and Root Beer. A 10-ounce bottle contains approximately 118 calories.

In announcing the expanded distribution of Zeltzer, Brand Manager Kathleen E. Delaney pointed out that the highly competitive flavored soda category accounts for approximately .5 percent of total soft drink industry sales, with anticipated 1987 sales totaling $204 million.

Polar Corp., Worcester, MA, added two varieties to its *Polar Seltzer* line last fall. Peach and Cranberry/Lime are now offered in addition to Grapefruit and Lime varieties. Other 1987 seltzer introductions include: *Crystal Geyser Kiwi-Lemonade Light Seltzer* from Crystal Geyser Water Co., Calistoga, CA; *Sparkling Peach Soda* and *Almond Creme* from R.J. Coor Naturals, Inc., Chicago, IL; *Diet Wild Mist Seltzers* from Kashu Fruit Products, Inc., Corona, CA; *Alhambra Seltzer Soft Drinks* from McKesson Corp., San Francisco; and *C&C Salt Free Seltzer* from C&C Cola, Elizabeth, NJ.

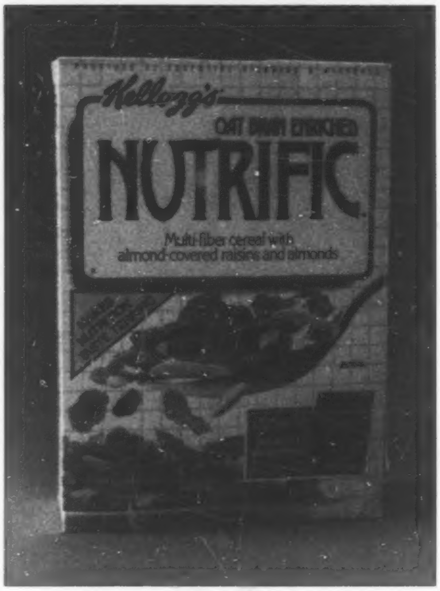
After Cadbury Schweppes bought Canada Dry Corp. Canada Dry flavored seltzers were reformulated to contain juice. They will be called sparklers. Bottlers remain optimistic about the future for this category – Cadbury Schweppes Inc. plans on introducing two lines of sweetened seltzers in 1988 which will also be called sparklers.

The bottled water category has grown to the point of attracting major players. Although the International Bottled Water As-

Food Introductions 1987
Calcium added

Product Name	Manufacturer	Product Name	Manufacturer
Barbara's Mashed Potatoes	Barbara's Bakery, Inc.	Summer Song Passion	Summer Song Fruit Products
Millbrook Diet White Enriched Bread	Stroehmann Bakeries	Summer Song Florida Thirst Quencher	Summer Song Fruit Products
Thomas' Protogen Lite-Wheat Bread	S.B. Thomas	Viva Lowfat Milk with Extra Calcium	Beatrice Companies, Inc.
FFV-Famous Foods of Virginia Ginger Boy Cookies	Interbake Foods Inc.	Health Clue Lowfat Milk	Crowley Foods
Perry's Light Premium Ice Milk	Perry's Ice Cream	Sealtest 2% Milkfat Lowfat Milk	Kraft Inc.
Olympiad Cheese	First World Cheese	Hood Nuform Plus Milk (in Lowfat and Skim varieties)	H.P. Hood
Dellwood Cottage Cheese	Dellwood Foods	Land O' Lakes Calcium-Plus Lowfat Milk	Land O' Lakes
Hood Nuform Lofat Cottage Cheese	H.P. Hood	Weight Watchers Chocolate Fudge Shake Mix	H.J. Heinz Co.
Hood Nuform Lofat Cottage Cheese with Chive	H.P. Hood	Weight Watchers Orange Sherbet Shake Mix	H.J. Heinz Co.
Crowley Health Club Calcium Fortified Cottage Cheese	Crowley Foods Inc.	Lifeway's Kefir (in Strawberry, Raspberry, Black Cherry, Plain Cappucino, Banana-Strawberry, and Blueberry flavors)	Lifeway Foods Inc.
Natren Yogurt Starter	Natren	Darigold Calcium Extra Lowfat Milk	Darigold, Inc.
Old Chicago Diet Seltzer Plus (in Root Beer, Mint Chocolate, Cranberry/Raspberry, Georgia Peach, and Almond Creme flavors)	Logret Import & Export	Alba '77 Fit'n Frosty Flavor Milk Mix	Weldon Farm Products
Crystal Light Plus Diet Soft Drink Mix (in Lemonade, Berry, Lemon-Lime, and Tropical Punch flavors)	General Foods Corp.	Calci-Fu Nondairy Tofu Milk Drink	Nature's Plus
		Calci-Fu Nondairy Tofu Chocolate Shake	Nature's Plus

Source: Productscan™/Marketing Intelligence Service



Nutrific from Kellogg's Co. – an oat bran enriched multi-fiber cereal with almond-covered raisins and almonds – is advertised as having terrific taste.

sociation, Alexandria, VA, estimates that more than 100 imported brands are being sold in the U.S. Most are in very limited distribution, though. Perrier holds approximately 75 percent of the $132 million wholesale imported water market. The Association also reports that there are more than 600 different U.S. produced brand labels.

In the overall bottled water market, Beverage Marketing Corporation gave 1987 U.S. per capita consumption as 6.2 gallons, with an expected increase to 11.7 gallons by 1996. About three-fourths of the bottled water consumed in the U.S. is nonsparkling or still water, while the remainder is sparkling. (A growing portion of the sparkling segment includes waters flavored with fruit essences or fruit juice.)

The 1996 projected figures for U.S. per capita consumption of bottled water fall short of what Europeans currently consume. The French and Belgian per capita consumption is currently at 14 gallons, for example. This leaves a huge potential with regards to water sales in this country.

Despite the health appeal of seltzers, bottled water, and sparklers, though, cola retains the lion's share of the soft drink market with approximately 65 percent. But perceived "health" beverage consumption continues to grow. The juice-added segment now represents five percent of the $39 billion soft drink category. The biggest announcement in this category came early last year when Dallas, TX-based Seven-Up Company announced that a national rollout of *Cherry Seven-up* and *Diet Cherry Seven-up* would begin in February. The new soft drinks would have the lemon-lime 7UP base with natural cherry juice and other natural flavors added. The product was not positioned as being in the "juice-added" category, but was targeted to 12- to 24-year-olds who wanted light, refreshing fruit tastes in a soft drink.

Another soft drink line with added juice to make its debut in 1987 was *High Five* from Detroit-based Stroh Foods, Inc., a subsidiary of Stroh Brewery Co. Naturally flavored with 10 percent fruit juice, High Five is offered in Peach, Orange, Raspberry, Cherry and Lemon-lime. Two diet flavors – Cola and Lemon-lime – are also available. The line is being tested in the Salt Lake City market.

Fiber-, calcium-added

Spurred by consumers' increasing interest in nutrition, new food products touting their fiber content are becoming more common, and in more food categories. Ever since bran cereal sales rose over 30 percent in 1984 when The Kellogg Co. ran an advertising campaign which suggested that increased consumption of bran cereals could help prevent certain types of cancer, the marketplace has seen an abundance of fiber-added products. (Research data suggesting that fiber-containing foods provide some protection against colon and rectal cancer led the National Cancer Institute to recommend that Americans consume 25 to 30 grams of dietary fiber a day.)

The initial flood of fiber-added foods was into the breakfast cereal category. A race began to see who could provide the highest amount of dietary fiber in a cereal. And the emphasis in breakfast cereals went from cereals for children to adult cereals focused on nutrition rather than taste.

Some changes were made in both product formulation and advertising, though, when manufacturers realized that adults also considered taste the most important factor in selecting a breakfast cereal. One survey to back this up appeared in *Prevention* magazine. Taste was listed as the most important consideration in selecting a cereal by 32 percent of those polled, while only 11 percent said the next consideration was that the cereal be "good for you."

The addition of fruits and/or nuts has been used by cereal manufacturers to increase the appeal of these cereals. Kellogg's *Nutrific* oat bran enriched multi-fiber cereal has both almond-covered raisins and almonds. The product is advertised as making nutrition taste terrific. A health passport from the American Health Foundation is included in each box. Nutrific has five grams dietary fiber per 1.3 ounce serving. Other entries in this category include General Mills' new *Clusters* which have honey-flavored clusters of almonds, walnuts, and pecans blended with wheat and bran flakes; and General Foods extension of *Post Fruit & Fiber* line to include a peach variety.

The growth of cereals with fiber or bran in the title is, however, growing at a slower rate than the overall cereal category. SAMI/Burke Inc. report a 6.1 percent growth in sales of fiber cereals from 1986 to 1987, and a 8.9 percent growth for the overall cereal category for the same period. The slower growth in the fiber cereal area may be due to consumers becoming aware of more different sources of fiber, says Alan B. Miller Jr. of SAMI/Burke.

New products in another category are also vying for the attention of adults interested in including fiber in a good-tasting breakfast. Deerfield, IL-based Sara Lee Corp. added *Corn Muffins* to its line of frozen muffins. The company introduced Blueberry, Banana, Oatmeal 'N Fruit, and Apple Cinnamon Spice varieties in the fall of 1986, and added the Golden Corn variety in September of 1987.

Advertising for Sara Lee Muffins is going head-to-head with cereal advertising, pointing out that the muffins: Contain four grams of dietary fiber per serving; can be heated in a microwave oven; and are individually portioned.

Fiber-added new foods in 1987 were not limited to cereals and muffins. Vegetables, pasta, cookies, and drink mixes were among the new food products introduced last year which were advertised as containing fiber. For example, *FI-BAR* – an all-natural fruity, high-energy bar containing 12 dietary fibers was introduced by Natural Nectar Corp., Culver City, CA. Initial markets are San Francisco, Los Angeles, and Boston.

A serving consisting of two one-ounce bars provides 10 grams of dietary fiber and 220 calories. FI-BARs consist of an inside portion of raspberry, lemon or mandarin orange flavored blend which includes almonds, apples, barley, rolled oats, rice, and other grains; and an outside yogurt coating, in vanilla or chocolate. Initial consumers research for these bars showed a 64 percent purchase intent, with 74 percent of those questioned liking them as a source of fiber, and 89 percent liking the bar's convenience.

Fiber was not the only nutritional ingredient added to new products last year – Calcium-enriched foods was another "hot" area. Preoccupation surrounding the amount of calcium in one's diet also dates back to 1984 when the National Institutes of Health linked osteoporosis with calcium deficiency.

Successful test markets for *Citrus Hill Plus Calcium* orange juice and grapefruit juice, resulted in national rollout of the products in April of 1987 by the Procter & Gamble Company, Cincinnati, OH. Initial test marketing began in September of 1986 in Evansville, IN, and Charleston, WV.

Citrus Hill Plus Calcium contains a unique type of calcium which clinical studies show is more readily absorbed by the body than calcium from other sources, according to P&G. The beverages contain as much calcium as milk and the same amount of vitamin C as regular citrus juice. They are offered in both frozen concentrate and ready-to-serve forms.

Later in the year, The Old Chicago Seltzer Co., Santa Fe Springs, CA, announced the August introduction of *Diet Plus*, a new diet seltzer containing a calcium/magnesium fortifier. Initial flavors were: Root Beer, Mint Chocolate, Cranberry/Raspberry, Georgia Peach, and Almond Creme. The beverage comes in a 10-ounce bottle. Each serving contains less than two calories, 100 mg of calcium, and 33 mg of magnesium.

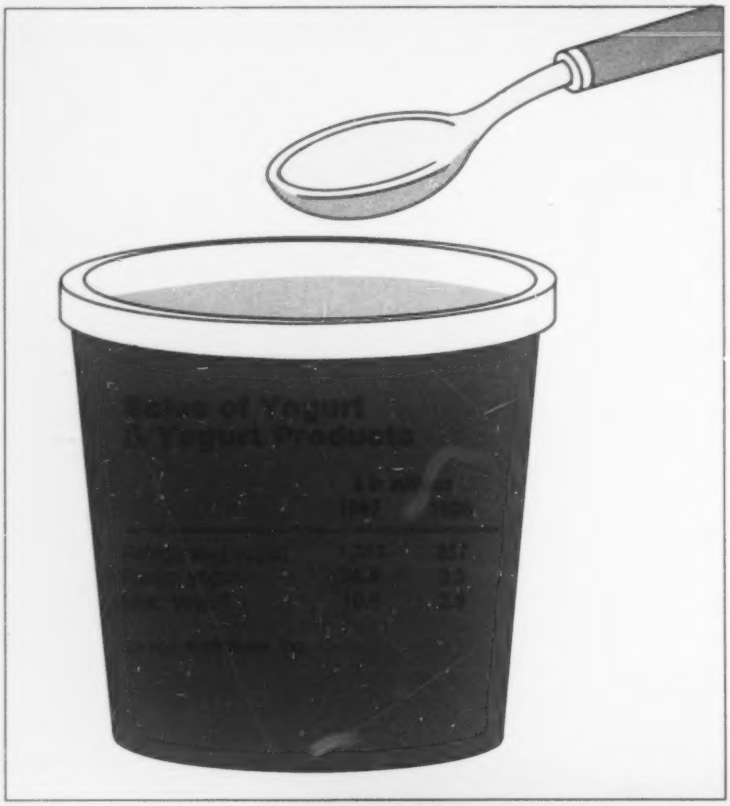
Other calcium-fortified introduced in 1987 are shown in the chart on page 108.

Yogurt & yogurt-like products

Several factors – including new product introductions – were responsible for the substantial growth within the yogurt category last year. Part of refrigerated yogurt's increase in sales from $857 million in 1986 to

Each 10-ounce bottle of Diet Plus (introduced last year) contains 100 mg of calcium and 33 mg of magnesium. Photo courtesy of The Old Chicago Seltzer Co.

OLD CHICAGO
SELTZER PLUS



$1,013 million in 1987 can be explained by Dannon's completion of its national warehouse system, explains Alan B. Miller Jr. of SAMI/Burke Inc. But that would only account for about a $75 million increase. Discounting the $75 million, still leaves a 9.4 percent increase. SAMI also shows a 14 percent gain for this category for the 12 weeks ending March 7th of this year showing no signs of let up in the category's growth.

Yogurt's healthy image has certainly been a factor in its popularity. The dairy industry hopes to continue to capitalize on this positive image. (See *FE*, February 1988, p.23 for details.)

H.J. Heinz, Pittsburgh, PA, announced the introduction of five *strained fruit yogurts* to the *Heinz Baby Food* line in April of 1987. Available in pear, apricot, mixed fruit, peach, and banana, the yogurts for babies are less tart and smoother than "adult" varieties. They also require no refrigeration prior to opening.

General Mills, Minneapolis, MN, introduced its *Yoplait 150* last year. It has 150 calories per serving as compared to original Yoplait which has 190 calories.

New entries to the yogurt drink category and expanded distribution last year increased consumer awareness of that seg-

The national rollout of Wispy was completed in 1987. This yogurt-like product is 99 percent fat free and water-based. Photo courtesy of Ice Dream International, Inc.

NEW PRODUCT ANALYSIS

Food and beverage introductions 1987
Top 20 companies by number of introductions

	No. of intros.
General Foods	67
RJR Nabisco	56
Kraft	55
Campbell Soup	48
Nestle/Carnation	40
Beatrice/Hunt-Wesson	37
H.J. Heinz	36
General Mills	34
Thomas J. Lipton	33
Pillsbury	30
Sara Lee	24
ConAgra	21
M&M Mars	21
Quaker Oats	21
Procter & Gamble	19
Geo. A. Hormel	18
Borden	17
Anheuser-Busch	16
Keebler	15
Classic American Foods	14

Source: Productscan™/Marketing Intelligence Service

ment. Although The Dannon Co., White Plains, NY, introduced *Dan'up Lowfat Yogurt Drink* in August of 1986, initially it was only offered in the Baltimore/Washington area. In early 1987, distribution of Dan'up was expanded to include Los Angeles, New York City, Philadelphia, Detroit, and Chicago. And by summer of that year the product was also offered in Orlando. This yogurt drink is available in Strawberry, Strawberry-Banana, Raspberry, Mix Berries, and Exotic Fruit.

Union, NJ-based Tuscan Dairy has marketed a yogurt drink for about 10 years. But heightened consumer awareness due to introductions of other brands has resulted in increased sales for *Tuscan's Yogurt Drink*. In 1987 the company did introduced a strawberry-banana flavor to its line.

Yogurt drinks were not the only segment of the yogurt category to benefit from new product introductions. Astounding sales growth of frozen yogurt was largely due to the rollout of *Yoplait Frozen Yogurt* from five markets in 1986 to 50 markets in 1987. SAMI/Burke Inc. report that frozen yogurt sales went from $9.3 million in 1986 to $26.4 million in 1987.

The introduction of a number of regional frozen yogurt products have contributed, to a lesser extent, to growth in this category. One example hails from Buffalo, NY-based Elan Foods, Inc. Originally introduced in 1986, expansion in 1987 has resulted in *Elan Premium Frozen Yogurt's* presence in Upstate New York, Vermont, Massachusetts, Delaware, Virginia, Maryland, Washington, D.C., and Ontario, Canada. The new frozen yogurt contains 3.5 percent butterfat and is being positioned as an alternative to super-premium ice creams. It is offered in Strawberry, Chocolate Almond, Chocolate, Vanilla, Coffee, and Blueberry flavors.

The popularity of the yogurt category has attracted other yogurt-like products. *Stir Fruity*, from Azumaya, Inc., San Francisco, CA, is a blend of tofu and fruit chunks and will be positioned on the yogurt and dairy shelves of Northern California's supermarkets. It is advertised as having 160 calories per serving—lower than low-fat yogurts.

Azumaya's early product testing indicated a strong receptivity to Stir Fruity among yogurt loyalists. Of yogurt users, 86 percent expressed "high purchase intent." And among non-yogurt users, 65 percent said they would purchase Stir Fruity.

In competition with the frozen yogurt category, products such as *Wispy*—a premium soft serve frozen dessert—are becoming more prevalent. The product is 99 percent fat free, water-based, and sweetened with fructose. It contains 12 calories per ounce. Initially introduced in 1986, Ice Dream International, Inc., of Sarasota, FL, expanded distribution of the product nationally in 1987.

Offering both good taste and a "healthy" image, yogurt products should remain in favor with consumers.

Future trends

Eight of last year's top ten food companies in new product introductions remain in this year's top ten. And many of the trends seen last year were carried over from previous years and will continue this year. In looking towards the future, as 1988 trends begin to unfold, several are already obvious. The lure of foods offering convenience is growing even stronger. But Americans are more determined than ever to get value for dollars spent. And for any food item to have long-term success, it must taste good.

Food companies which will come out ahead are ones that "stimulate creativity and innovation through their organization," points out Tom C. Veblen, President, Food System Associates, Inc., Washington, D.C. This is especially true within the R&D department. Companies must also increase their ability to monitor, interpret, and anticipate consumer and technological shifts to win at the new products game, adds Veblen.

C2|30-6
5|23|88

CHILTON'S

MAY 1988

FOOD ENGINEERING

R&D IN EUROPE

FOOD ENGINEERING

COVER STORY

Countries on each side of the Atlantic Ocean sometimes seem more aware of the trends coming to them from across the ocean rather than those right under their noses. Photo courtesy of Unilever.

Pages 64 to 78

News

13 Industry Report
This month's Report talks about how the French market is changing and why the philosophy of going to market will have to change with it; a new study on the increasing market for takeout foods; the growing rate of national glass recycling; and a prediction of small growth for the cookie/cracker market.

Departments

9 Editorial
10 Calendar
13 Industry Report
25 Marketplace
37 Packaging
186 New In Print
204 People

SEALING SYSTEM: **PAGE 37**

Engineered Foods

42 CWS Starches
New cold-water-swelling starches combine the convenience of instant starches with the quality of "cook-up" starches. These formulations are ideal for the microwave.
48 Middle-aged Market
The new challenge to food scientists is to formulate microwaveable foods to fit the changing dietary needs of the middle-aged market.
55 Delta T Theory
Basic research aimed at customizing flavors shows how to overcome flavor problems in designing microwave foods.
60 Olestrin
The new entry in the fat-substitute sweepstakes combines dextrins and maltodextrins with sucrose polyester and triglycerides for three calories per gram or less.
62 Choices

MICROWAVEABLE FOODS: **PAGE 48**

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) May 1988, Vol. 60, No. 5. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1987. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

Features

64 R&D in Europe
FE sent an editor to Europe for three weeks to study research developments of food processors, suppliers to the food industry, and government research centers.

81 IFT Pre-show Report
IFT promises to be larger than ever this year, including a record-breaking number of exhibits.

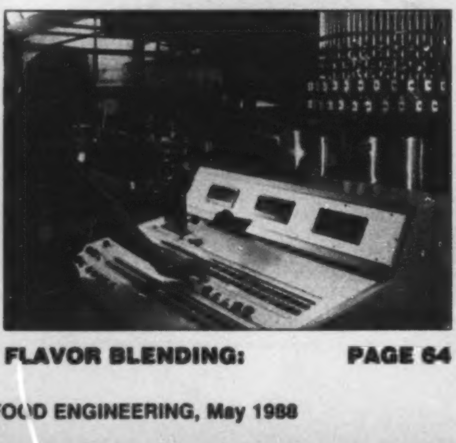
127 Local Area Networks
As more PCs are added in the plant, it is time to look for effective distributed control.

137 Ingredients Buyers Survey
Using natural ingredients is still a big issue to ingredient buyers according to our annual survey, but the real impact of microwave ovens is beginning to be felt.

145 Talking with Ted Labuza
IFT's president-elect Ted Labuza discusses the challenges facing food scientists.

153 Managing Technology
R&D's health often comes down to non-technical management's attitude toward technology.

163 Labeling, Coding & Marking
In-mold labeling, thermal sensitive inks, and captivated OPP lead the list of what's new.



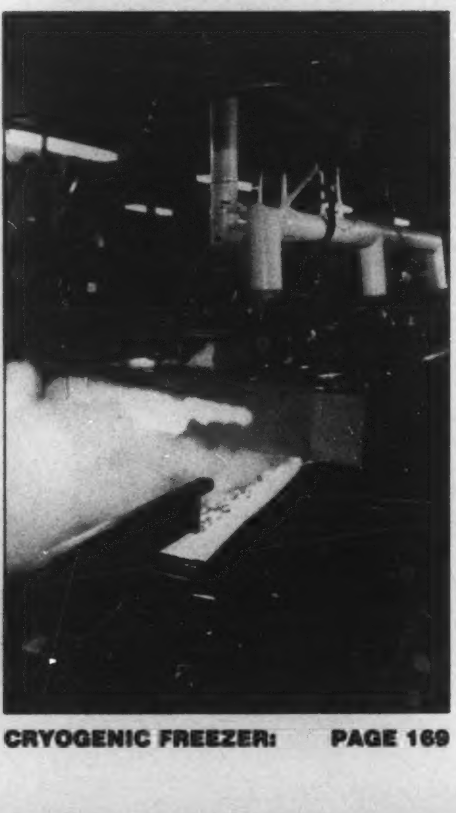
FLAVOR BLENDING: PAGE 64

From the Field

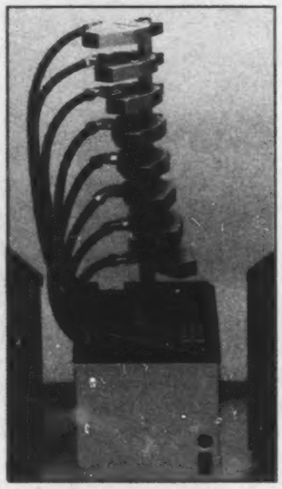
169 Switch to nitrogen freezing doubles production
175 Accurate temperatures in microwaves hard to achieve
181 Production line upscales with combination net weigher
184 Coating system saves dairy cooperative $2,000 per tank

New Equipment

192 Processing Equipment
196 Packaging Equipment
201 Instruments/QC



CRYOGENIC FREEZER: PAGE 169



Special Emphasis

LABELING, CODING & MARKING

Container identification has never been more important than it is today. The increase in point of purchase buying decisions have made labeling an integral part of any marketing campaign.

Pages 163 to 166

Cashing in on a French food industry poised for change

FOOD PROCESSING MACHINERY
(Millions of French francs/U.S. dollars)

	1984	1985	1986	1987	Est. 1988	Est. 1989	Proj. 1990
Imports into France	3[illegible]66 396	3743 416	3990 578	4274 712	4565 650	4876 813	5046 841
French production	5657 647	5772 641	5982 867	6278 1046	6402 1067	6686 1114	6887 1147
Exports	3107 355	3138 348	3289 476	3301 550	3334 556	3367 561	3700 617
Net	6016 688	6377 709	6683 969	7251 1208	7633 1161	8195 1366	8233 1371

France is not just a country beginning significant changes in its food industry because of both national and international opportunities; it is also a country already committed to importing and exporting equipment as ways to stoke its economy.

Last month we reported on the work being done to realize a U.S. exhibitor pavilion at the GIA Show in Paris (November 4-9), which could help American equipment manufacturers take advantage of both the French market in particular and the European market in general.

Recently, we received the latest assessment of the French food industry from the U.S. embassy in Paris, and we thought it might be helpful for putting potential U.S. manufacturer participation in perspective.

For one thing, the French market is changing and the philosophy of going to market will have to change with it. Two major things to consider:

- 1. "The industry," notes the embassy, "will undergo a reorganization," with greater concentration of and consolidation into larger companies. "Up to the present time, too many small companies have been too scattered geographically for France to cope with international competition. Vertical and horizontal integration will be maximized before 1992." France surely poses any number of opportunities for this kind of consolidation. Available estimates are that better than 80% of the French food manufacturing facilities employ fewer than 100 people.
- 2. What's so special about 1992? That is the target date for the creation of the European Economic Community (EEC) single market and the elimination of customs tariffs. This means: a) France will have open to it "a new economic and business market of 320 million customers," and b) France's domestic market will itself be more open to competition. The former at least may be a real boost, because even though France is the number one food exporter in the world, international sales have been slumping. But it will also mean a reindustrialization of French food manufacturing that will demand "increased investment to deal with international demand, and competition" from other countries, notes the embassy. Because "the French food processing industry has been hampered up until now by the aging of its equipment."

But it is not just the changes that will come in the EEC that will stretch the capabilities and imaginations of French food manufacturers. On the one hand, consumption in France has remained relatively flat, and immediate future predictions don't see major percentage improvements. On the other hand, this leaves a fertile field for new product development, and the stimulation of the market by launching new products. In fact, according to some experts, 60% of the food products in France that will be consumed in the year 2000 have not been launched yet. Which is why greater importance than ever before is being put on R&D to grow businesses.

Also, as *Food Engineering International* magazine has noted, "French consumers in general have many of the same demands as their counterparts around the world. More women are working, shopping is done less frequently, and the large supermarket—the hypermarket—is undergoing tremendous growth." Some results: "Experts predict the French food sector will be characterized by an increasing number of prepared and semi-prepared foods."

These are all reasons why, even though the U.S. embassy indicates that "French demand for food processing equipment has been erratic,... [equipment] import levels were up again in 1986 and 1987, and are likely to speed up" in 1989. In fact, the embassy estimates that the real growth rate for imported equipment will be 3.5% per year through at least 1990 (see accompanying chart).

The embassy also predicts that, like U.S. industry:

- French food processing is going to need to develop more transfer technology than ever before (transfers will be "booming" is the way the embassy describes it), as French food manufacturers learn from areas like the cosmetics and pharmaceutical industries how to best process and package foods for future markets where

The Right Answer Starts with the Right Question

Question:

Can I concentrate juices, sweeteners, colors, flavors, fragrances, or other heat sensitive molecules when I only have 2-25 liters of starting solution in my laboratory?

Answer:

Yes, with smaller bench top versions of Millipore's tangential flow membrane filtration systems.

Bench Top Development Systems provide:

- Greater Product Stability: separate without heat and air exposure.
- Application Flexibility: can separate molecules and ions, with reverse osmosis or ultrafiltration in a single system.
- Energy Efficiency: no evaporation needed.
- Low hold up volume maximizes product yield.
- Scalable data to larger systems when you need them.

LET MILLIPORE SHOW YOU WHY MEMBRANE SYSTEMS ARE COST-EFFECTIVE

Call us today at **1-800-225-1380** (east coast) or **1-800-632-2708** (west coast) to schedule a free demonstration. Let Millipore provide answers to your separation questions.

Visit us at the IFT Show, Booth 2329

MILLIPORE

Circle 12 on Inquiry Card

microbiological and shelf-stability issues will become more and more pressing.

- There will also be a new push toward automation, process control systems, and even robotization, "requiring cooperation with the electronic engineering industries."
- Flexible and rigid plastic packaging and packaging systems are expected to gain "a lion's share" of the market against metal. Indeed, use of metal has been in eclipse among food manufacturers for several years, and the only metal packaging segment showing growth has been aerosol cans. Over the last 20 years, plastic has come to amount to 30 percent of total packaging.
- There will be a major demand for individual-portion packages.

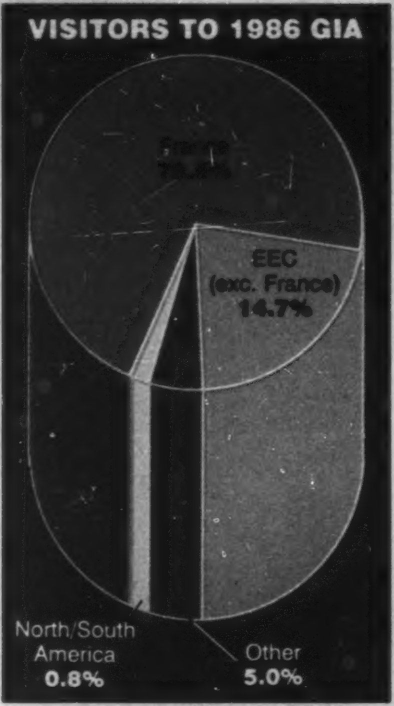
As far as the U.S. equipment supplier doing business in France is concerned, the embassy thinks that one of the best niches for U.S. penetration will be automation and process control (the embassy notes that "the demand for electronic process control systems will be widely increasing in coming years"). There will also be a large market for whatever types of turnkey operations the U.S might be able to supply.

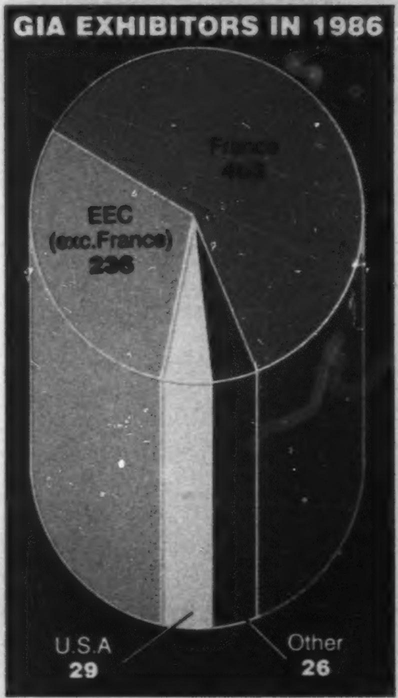
In general, the main competitors to U.S. suppliers are those German and Italian firms that specialize in sophisticated automation equipment. Specific European competition includes: Meat machinery from West Germany; fish processing and milk processing equipment from Scandinavia; canned fruit and tomato equipment from Italy and Spain; and candy equipment from Great Britain.

The deciding factors in getting U.S. equipment into the French food industry will first and foremost be being able to offer new products and new technologies, says the embassy, but availability of maintenance and other after-sales services will also play a large part.

Pricing will not be a big factor, unless exchange rates take a turn for the worse (that is, from the French point of view).

In short, France is worth at least a second look as a target of opportunity for U.S. investors.





With certification of a turnkey pavilion in place, there will be a greater chance for U.S. manufacturers to be more of a presence than in 1986 at what is *the* major European food manufacturing show. There will also be an excellent chance for visitors to see not just what France has to offer, but the best of Europe as a whole.

Circle 13 or see FEM, p. 247→

Home: where the heart is—and more takeout food than ever before

New figures on consumer eating and nutrition habits from The NPD Group (Park Ridge, IL) were presented by NPD vice president Harry Balzer to the plenary session at Pack Alimentaire this past March in San Francisco. They were part of a report entitled "Eating Patterns in America," and some of the information may cause food marketers to more clearly focus their thinking, and even to reappraise what some have felt to be virtual truisms about the nature of the markets they serve.

The NPD information comes from two dairy panels, one of 2,000 respondents who provide in-home consumption data to NPD's National Eating Trends, and 12,800 respondents that feed into NPD's CREST project covering away-from-home eating patterns.

Right off the bat, Balzer noted one significant development: "Families grew as a share of the U.S. population for only the second time in two decades." By the year 2000, who will be the fastest-growing population segments? "Persons over 75, older affluent households, and two-parent families with children," Balzer said.

To show how these sorts of demographics might play a part in manufacturers' planning, he profiled restaurant take-home meals by using a segmentation analysis technique that NPD calls "lifecycle": designations like Affluent Singles, Working Parents, Single Parents, Affluent Empty Nesters, Single Active Elderly—12 categories altogether. Charting these to show take-home share of total restaurant meals or snacks for each group, the clear winners were those lifecycles that involved households with children, running anywhere from six to eight percent above the average for all groups. Balzer's data implies a couple of things. For one, the growth of families in the U.S. population mentioned before will have a good deal of meaning for the take-home subsegment of the restaurant market. For another thing, it will also have more of an impact on that market than will the increase in the elderly or in older affluent households, both of which might have been assumed to have been moving into a heavier take-home mode.

Distribution of Households by Homemaker's Attitude

The NPD had also done a segmentation analysis to look at homemaker attitudes: "Does a household's eating behavior reflect the concerns of the homemaker?" There turned out to be five behavioral groups in this regard: Diet Conscientious, Sophisticates, Naturalists, Meat & Potatoes, and Kids Around. "Once the behavioral groups were identified .... four attitudinal groups were identified": Nutritionally Fit, Busy Urbanite, Conventional Tastes, Restrictive Dieters.

The largest behavioral group were those who were diet conscientious; the largest attitudinal group were those who were nutrition conscious.

No surprises—yet. But, Balzer demonstrated, "By crossing attitude and behavior, a four year trend showed nutritionally concerned households that ate conventionally were growing steadily—while nutritionally concerned households that ate nutritious/healthy food were not." (Looks like the old double standard between what you feed your head and what you feed your stomach.)

Far and away most main meals are still being prepared at home. We are, however, eating fewer breakfasts, according to Balzer; per capita use of restaurants is holding steady; and what

PASTA-
BILITIES

Improve your product with the right pasta! You pick, the shape, we adjust size or ingredients to suit your product exactly.
For custom pasta call Zerega, where anything is pastable.

RIGATONI
ZITI
BOCCONE
PENNE RIGATE
ZITI RIGATI
FIORE

Zerega
CUSTOM
PASTA DIVISION

A. Zerega's Sons, Inc.
20-01 Broadway/Fair Lawn, N.J./07410
(201) 797-1400

For a free color poster of all the pastabilities, call or write today.

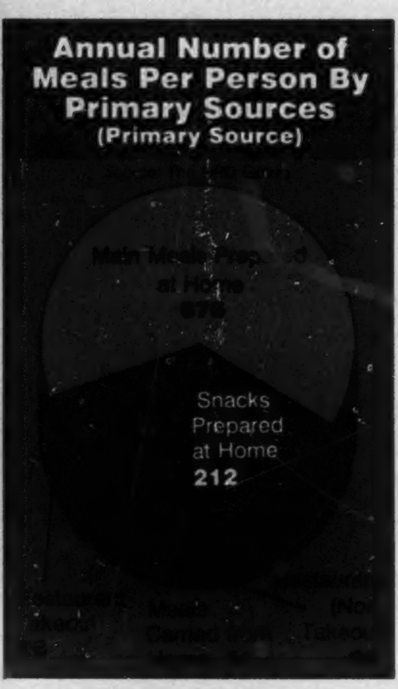
Circle 14 on Inquiry Card

Balzer describes as "America's love affair with the take-home meal grows without interruption – and almost exclusively at dinner."

All of these factors point in one way or another to the inclusion in everyone's lifestyle of the need for greater convenience. Again, no revelation there. But for a food manufacturer it is in the details that new insights for the future may be found. For example, consider the amount of advertising that has been put behind a brand name like "Stove Top Stuffing" to capitalize on the convenience of having good tasting stuffing that is not dependent on having a large bird or an oven to cook it in. Well, according to Balzer and NPD, the stove top, while it is still king of the hill among food preparation methods, is at the same time the fastest declining method of food preparation currently in use.

On the other hand, the redoubtable microwave, that everyone points to as the appliance of the future, is still very much just that – with the emphasis on *future*. Since 1983, in terms of use for preparing meals, it has only been able to catch up with the toaster oven, each holding about 14 percent share of use.

The good news, though, for companies staking a serious percentage of their hopes on microwave foods, is that the microwave has doubled its usage rate while every other means of meal preparation except the barbecue and the crock pot have declined – and even they have only held steady at one percent and one-half percent, respectively. [Ed. Note: *Food Engineering* confidently predicts no huge crock pot surge in the near future.]


Annual Number of Meals Per Person By Primary Sources
(Primary Source)

Another detail: Marketers have been throwing frozen breakfast products – including waffle and bagel exotica – at us almost as fast as you can open the frozen food cases, and frozen entrees even faster. However, the NPD research shows that, according to Balzer, "usage of frozen forms of product has increased primarily at lunch" rather than at breakfast (-2 percent) or at dinner (only +1 percent).

Last but not least, Balzer led the audience through what Americans were

APV
CREPACO

APV Anhydro has become APV Crepaco, Dryer Division.

"Same team, different jersey" describes the name change from APV Anhydro to APV Crepaco. This means that you can count on the same APV Anhydro-quality spray dryers for lab, pilot and production situations. And you can count on the same team of experienced engineers.

So what's new? The added benefit of a complete line of APV Crepaco liquid feed handling, homogenization, and refrigeration systems, *plus* automation instrumentation, architectural direction, and erection capabilities. Call us for your next dryer project.

APV

APV Crepaco Inc
260 John L. Dietsch Square, Attleboro Falls, MA 02763
Tel: (617) 695-7014. FAX: (617) 695-7018. Telex: 92-7634.

Circle 15 or see FEM, p. 44

telling NPD about food and beverage preferences generally.

The winners: "Carbonated soft drinks, pizza, and rice...for both in-home and restaurant meals. And ethnic dishes...are hot on the heels of pizza as significantly growing restaurant entrees over time."

The losers: " 'Side dish' salads have undergone a steady decline in popularity both at home and in restaurants since 1983. Cakes and pies have followed suit as well."

A trend perhaps to ponder: Low and lite. Pointed out Balzer, "The use of lite/low calorie products failed to grow from the previous year." (In writing our cover feature on low, light, and natural foods in February of this year, we noted the "paradox" that regardless of the reduced-calorie food available to U.S. consumers, "per-capita consumption of calories continues to rise.")

One final observation. We hear a great deal about the explosion of the chicken and fish industries. Detail from NPD: "The red meat sandwich reigns supreme as the most popular entree-oriented item both at home and in restaurants in the latest year of reporting."

The message—look past the broad trends. Find what is happening in the details, the nooks and crannies. These may be the markets yet to take shape.

Effort required on food safety issues

Food safety affects every segment of the American food industry and represents the most challenging public policy issue confronting the food industry today, warned Manley Molpus, American Meat Institute (AMI) president, in a speech to the National Meat Canners Association.

"The safety of the food supply is the central public issue facing the food industry today. To deal with it successfully, it is essential that every segment -producers, manufacturers, processors and retailers-work together to reassure consumers and, most importantly, work to make the best food safety system in the world even better."

AMI's Board of Directors recently approved a comprehensive meat safety program that includes research to reduce the incidence of Salmonella and Listeria and recommendations to strengthen the government's residue prevention program. AMI has also published a comprehensive meat safety booklet, "The U.S. Meat Supply; Your Safety Assured."

Molpus urged the food industry to support legislative and regulatory proposals. He pledged AMI would cooperate fully with all segments of the food chain to further improve the industry's ability to ensure an even safer food supply.

Increase in national recycling rate

The Glass Packaging Institute has announced support for a recommendation by the U.S. Environmental Protection Agency to reduce the solid waste stream and increase the national recycling rate by 25 percent over the next four years.

The glass container industry currently supports numerous activities to promote recycling in more than 20 states. "We believe comprehensive curbside recycling is the most effective means of reaching EPA's goal of a 25 percent national recycling rate."

Comprehensive curbside recycling requires consumers to sort wastes into separate containers that hold the same recyclable material. The separated trash is then collected at curbside by municipalities and transported to recycling facilities.

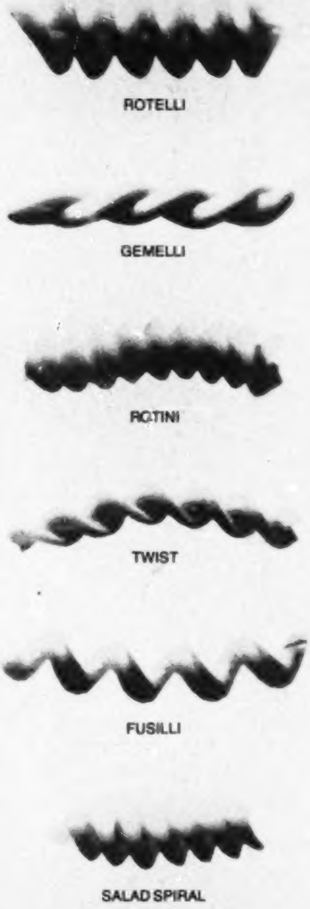
Lewis D. Andrews Jr., GPI president, cited New Jersey's mandatory recycling program as a model for other states to follow. The New Jersey law requires counties and municipalities to enforce ordinances mandating separation of leaves plus three other items on the state's "recyclables" list. New Jersey's goal is to reduce its solid waste stream by 25 percent in two years.

Kellogg launches awareness campaign

Kellogg is taking a high-visibility role in nutrition by launching a corporate campaign to educate the U.S. public on diet and good health. The year-long program is aimed at lowering cholesterol levels and will include a major consumer print advertising campaign in leading national magazines.

PASTA-BILITIES

Increase your product sales with a new twist. Long or short, thick or thin, we'll customize the perfect pasta for you. Call Zerega, where nothing is impastable.



Zerega
CUSTOM
PASTA DIVISION

A. Zerega's Sons, Inc.
20-01 Broadway/Fair Lawn, N.J./07410
(201) 797-1400

For a free color poster of all the pastabilities, call or write today.

Circle 16 on Inquiry Card

INGREDIENT BUYERS' SURVEY

MICROWAVES TAKE OVER

Using natural ingredients is still a big issue to ingredient buyers according to Food Engineering's annual survey, but the real impact of microwave ovens is just beginning to be felt.

JOYCE FASSL
Managing Editor

While the use of natural ingredients still plays a major role for ingredient buyers according to *Food Engineering's* annual survey, the cry for improved ingredients for use in microwave products is being heard louder than ever before.

Microwave coating systems for meat, better breading systems, better browning systems, and flavors for popcorn (such as cheese, caramel, and butter that is in the popping bag, not sprinkled on) were mentioned again and again by over 350 food industry professionals who took part in the *Food Engineering* Executive Advisory Panel survey on ingredient buying trends.

These results are far from surprising since microwave ovens have invaded more than 70 percent of American homes, and this num-

Product Development Influences By Industry

Food Engineering's Executive Advisory Panel rated the importance of major influences on ingredient and product development. The numbers in this chart represent the percentage of panel members that indicated these categories were a major factor in influencing their decisions.

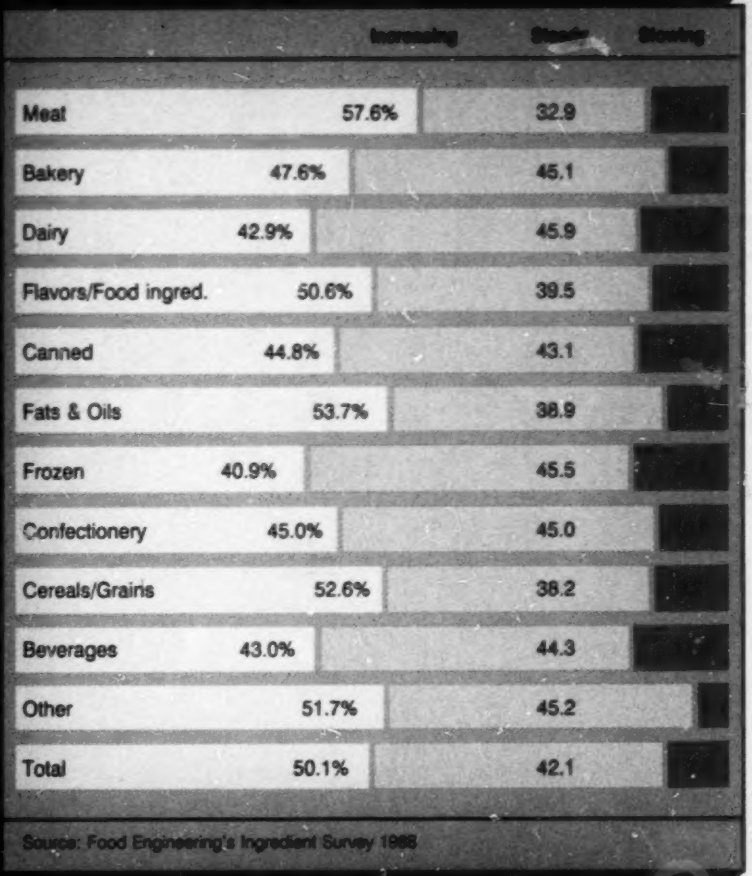
	Total Panel	Meat	Bakery	Dairy	Flavors/ Food ing.	Canned	Fats & Oils	Frozen Foods	Confectionery	Cereals/ Grains	Beverages	Other
Using natural ingredients	54.6	48.2	53.7	42.9	58.0	53.4	44.4	47.7	50.0	46.1	62.0	54.0
Lessening/eliminating preservatives	34.9	32.9	32.9	21.4	32.1	36.2	33.3	28.5	30.0	30.3	45.6	35.6
Vitamin fortification	14.6	5.9	17.1	11.2	4.9	10.3	5.6	9.1	8.3	21.1	8.9	20.7
Mineral fortification (particularly calcium)	10.1	5.9	9.8	10.2	3.7	8.6	5.6	9.1	6.7	11.8	8.9	19.5
Low- and reduced-calorie foods	26.9	34.1	28.0	26.5	28.4	25.9	24.1	27.3	23.3	26.3	29.1	28.7
Reducing sodium content	31.6	38.8	32.9	26.5	37.0	32.8	31.5	29.5	36.7	35.5	27.8	29.9
Saturation level of fats	23.3	18.8	24.4	24.5	18.5	20.7	33.3	22.7	30.0	22.4	13.9	31.0
Reduced cholesterol content	18.2	20.0	23.2	21.4	14.8	22.4	31.5	25.0	23.3	15.8	6.3	19.5
Incorporating fiber	14.3	8.2	25.6	8.2	12.3	12.1	14.8	15.9	13.3	23.7	10.1	16.1

Source: Food Engineering's Ingredient Survey 1988

INGREDIENT BUYERS' SURVEY

Pace of New Product Activity By Industry

The panel was asked to rate the pace of new product activity in their companies compared to last year.

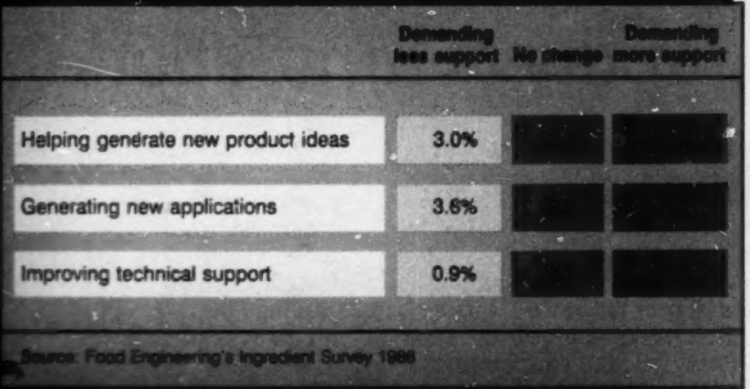


	Increasing	Steady	Slowing
Meat	57.6%	32.9	[illegible]
Bakery	47.6%	45.1	[illegible]
Dairy	42.9%	45.9	[illegible]
Flavors/Food ingred.	50.6%	39.5	[illegible]
Canned	44.8%	43.1	[illegible]
Fats & Oils	53.7%	38.9	[illegible]
Frozen	40.9%	45.5	[illegible]
Confectionery	45.0%	45.0	[illegible]
Cereals/Grains	52.6%	38.2	[illegible]
Beverages	43.0%	44.3	[illegible]
Other	51.7%	45.2	[illegible]
Total	50.1%	42.1	[illegible]

Source: Food Engineering's Ingredient Survey 1988

Demands on Ingredient Suppliers

The panel was asked to rate the changes, if any, of demands on ingredient suppliers in the three areas listed below.



	Demanding less support	No change	Demanding more support
Helping generate new product ideas	3.0%	[illegible]	[illegible]
Generating new applications	3.6%	[illegible]	[illegible]
Improving technical support	0.9%	[illegible]	[illegible]

Source: Food Engineering's Ingredient Survey 1988

ber is expected to increase in the years to come.

Nothing but blue skies

As part of the survey, the panel was asked to "blue sky" for us and tell us the kinds of ingredients or ingredient systems they would like to see that are currently not available. The two most-mentioned responses had to do with microwave ingredients, followed closely behind by the continued use of natural ingredients (which dominated last year's survey).

"An understanding of what is required of an ingredient to deliver performance in microwave ovens would be of benefit," said an R&D laboratory manager from California, "[because] microwave food development is highly empirical."

Another R&D worker, from Illinois, dreamed about flavors that bloom properly in the microwave both from the standpoint of kitchen odor and product flavor.

A vice president of product development from Georgia thought that much more emphasis is needed in flavor systems exclusively for microwaves. Why? Because, he claims, "in R&D, far more work than ever is being done on products which will only be microwaved or have a 90 percent chance of microwaving."

Other "blue sky" suggestions we found interesting included the call for "a flavor house that has lead times shorter than 6 weeks" from a packaging services manager in Wisconsin, and "more cooperation from Mother Nature," according to a chief engineer from Florida.

This year for the first time we asked the members of the panel which ingredient areas needed improvements in either quality or capability to produce not only microwave products, but plastic-packaged products, controlled atmosphere and vac-pac products, and aseptic products.

According to the panel, improvements in ingredients for microwave products were needed for cheese, natural flavors, modified starches, and seasonings and spices. On the other hand, respondents saw little need for improvement in areas such as mineral supplements, salt and phosphates as far as microwave applications were concerned.

For products packaged with plastic, the panel told us they would like to see improvements in antioxidants/preservatives, and natural flavors. At the bottom of the list: mineral supplements, phosphates and enzymes.

In the area of controlled atmosphere or vac-pac products, natural flavors and

140

antioxidants/preservatives were the two areas where the panel asked most for improvements. Some of the other ingredient areas where the panel suggested improvements were needed included fats and oils, flavor enhancers and cheese for this product area.

And for aseptic products, the most interest was shown in improving emulsifiers and natural flavors. Some interest was also shown in artificial flavors, flavor enhancers and stabilizers.

No stopping natural

Using natural ingredients was a factor for greater than 90 percent of the panel when making ingredient and product development decisions.

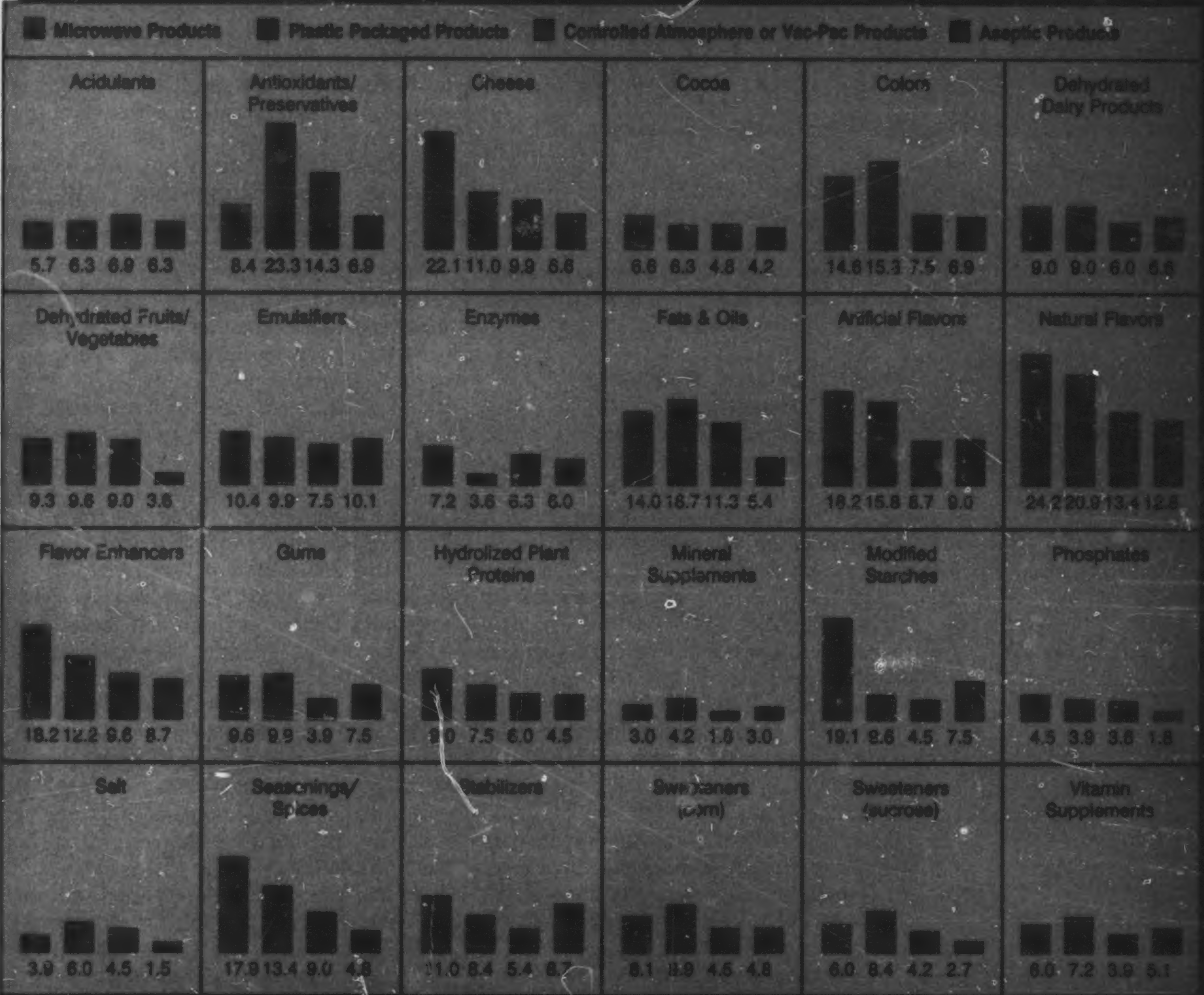
A senior laboratory technician from New Jersey summed up what most of the panel thought when he told *FE* that he would like to see "ingredients that are flavorable, nutritious and natural [natural meaning minimally processed]."

The panel told us they wanted natural meat and poultry flavors, natural antioxidants, natural preservatives for baked goods, heat stable natural colors and flavors, and natural emulsifiers.

Lessening and eliminating preservatives was a factor for 80 percent of the respondents. Next in line were low and reduced cal-

Ingredient Categories Needing Improvement In Quality or Capability

The panel was asked to indicate which ingredients needed improvements in either quality or capability to produce better products. The numbers indicate the percentage of respondents who saw a particular need for improvement in the areas listed below.



Movement Toward Use of One Supplier or a Favored Supplier

The panel was asked if their companies were moving towards the use of one supplier or a favored supplier for ingredients needs in the categories listed below.

	Not moving toward it	Moving toward it	Already using this practice
Flavors	32.8%	[illegible]	[illegible]
Colors	31.9%	[illegible]	[illegible]
Sweeteners	36.7%	[illegible]	[illegible]
Fat & Oils	33.1%	[illegible]	[illegible]
Gums/Thickeners/ Emulsifiers	32.2%	[illegible]	[illegible]
Spices & Seasonings	28.7%	[illegible]	[illegible]

Source: Food Engineering's Ingredient Survey 1988

orie foods and reducing sodium content, with both categories a factor to 74 percent of the ingredient buyers.

Saturation level of fats and reduced cholesterol content were a factor to approximately half of the panel.

New product activity on the increase

The pace of new product activity, while still increasing in 50 percent of our respondent companies, is increasing at a slower rate than last year's survey showed. In 1987, 60 percent of the respondents said new product activity was increasing at their companies. At the same time, new product activity is staying steady at 42 percent of the panel companies this year compared to 33 percent last year.

We also asked the panel how demands on ingredient suppliers have changed in relation to helping generate new product ideas, generating new applications and improving technical support.

Seventy percent of the survey respondents reported that they were demanding more and wanted improved technical support. To a somewhat lesser extent, 45 percent of the panel said they are demanding more support from ingredient suppliers for generating new applications, and 37 percent of the panel are demanding more support from their suppliers in helping to generate new product ideas.

Variance from spec

The question that sparked the biggest controversy on this year's survey was: Is your company willing to pay a premium for assurance of zero variance from spec in the ingredients your suppliers provide?

The responses were split almost down the middle. More than 55 percent of the panel said they would be willing to pay a premium for zero variance.

Of those people working with canned foods, 72 percent responded positively, followed closely by 63 percent of those who work in flavors and food ingredients. Of the respondents who said that they are willing to pay a premium, most said they would only pay for special situations, not for every ingredient.

A plant engineer from New York complained that even though his company asks for zero variance, "so far none of the ingredient suppliers, in spite of the premium paid, meet the spec." As a result his company is spending additional time to check all of the ingredients.

"Quality must be consistent," said a vineyard owner from Pennsylvania. "It is even more important with new technologies. Also, Proposition 65 forces close monitoring of all product components for compliance."

Many of the respondents who said they would not pay a premium for zero variance were angry and quite adamant about not paying a premium.

"A spec is a spec," cried an Arizona executive director. "If it cannot be met, it or the process must be changed. The idea of paying a premium to assure that a product meets a supplier's guaranteed spec is ludicrous."

A marketing director from Arizona said he could live with very small tolerances in ingredients just as regulators can live with very small tolerances in his companies' finished products. "I cannot see extras dollars for absolute zero," he added.

Many of the respondents told us that zero variance from spec was unobtainable. A packaging manager from Kansas put it bluntly—"Zero variance is a dream." A group leader from Illinois and a packaging R&D worker from Minnesota echoed the lament. While the group leader says he would be willing to pay the price, he also thinks he will never get zero variance. The R&D worker said that his company works with ingredient suppliers to arrive at a mutually acceptable spec, but added that "zero variance is unrealistic."

CHILTON'S

JUNE 1988

C2150-6
6/23/88

FOOD ENGINEERING

STREET JOU
Dow Jones & Company, Inc. All Rights Reserved
TUESDAY, OCTOBER 20, 1987
Market Fallout
The Crash of
Stocks Plu
Amid Panic
The Big Crash
DJIA at 15 minute intervals
Friday's close 2246.74
of '29?

FOOD'S PERFORMANCE OVERSHADOWS WALL STREET LOSSES

ANNUAL STATE OF THE FOOD INDUSTRY

FOOD ENGINEERING

COVER STORY

If you were keeping score in 1987, it is plain to see that the food and beverage industry ended the year a winner, despite the curve ball the stock market hurled at the economy on October 19.

Pages 73 to 96

News

13 Industry Report

This month's Report talks about the new cholesterol risk levels as defined by the National Cholesterol Education Program; product safety issues affecting the dairy industry; Borden's rise to increased market leadership through 51 acquisitions in the past year; and a rare glimpse into the operations of privately-held Cargill Inc.

Departments

9 Editorial
10 Calendar
13 Industry Report
31 Marketplace
45 Ingredients
132 New In Print
167 People

Lite
Pierre's
Lite
Gourmet Ice Milk
Pierre's
Lite
Gourmet Ice Mi

LOW CALORIE ICE CREAM: PAGE 31

Food Packaging

52 Pack Alimentaire '88

The latest Pack Alimentaire in San Francisco hit on hot topics ranging from microwave/dual ovenable packaging to modified atmosphere packaging to consumer behavior.

58 Effective Barriers

Inline fluorination process yields polyolefin containers with flavor and aroma barrier for a variety of applications.

64 Consumer Attitudes

There are many forces driving new package development. Perhaps the most important one is the consumer.

68 PET

Enhanced heat resistance puts PET on the brink of further advances in packaging applications.

70 Detecting Leaks

Detection of leaks in both empty and filled flexible containers is vital to package integrity and safety.

72 Literature

POLYOLEFIN CONTAINERS: PAGE 58

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) June 1988, Vol. 60, No. 6. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ™Chilton Company, 1987. All rights reserved.

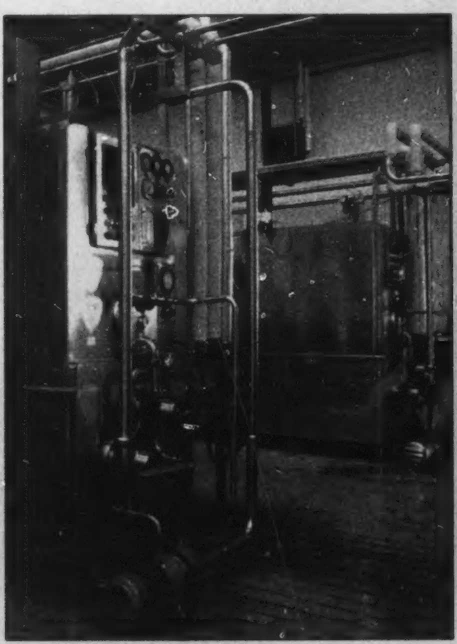
POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

CHILTON
FOOD
GROUP

Features

73 State of the Food Industry
The shock waves of the October 19 stock market "adjustment" reverberated through the economy. The food industry weathered the storm well and appears to have positioned itself to withstand further economic downturn.

101 Refrigeration & Freezing
Refrigeration and freezing technology rarely stuns the processing world with new innovations. Rather, improvements come in steady increments to help the processor achieve his marketing goals.



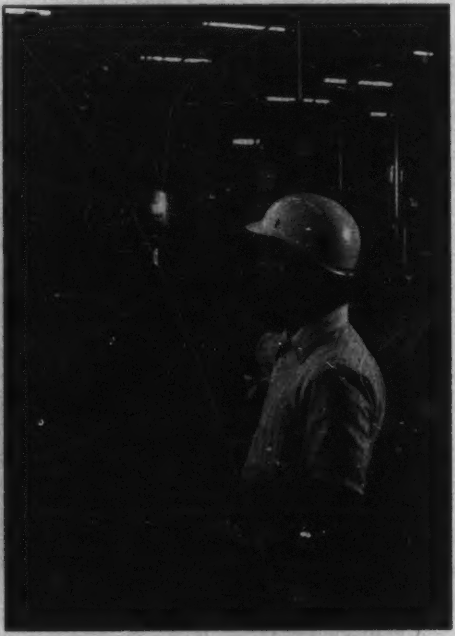
CONTROLLED FREEZING: PAGE 101

From the Field

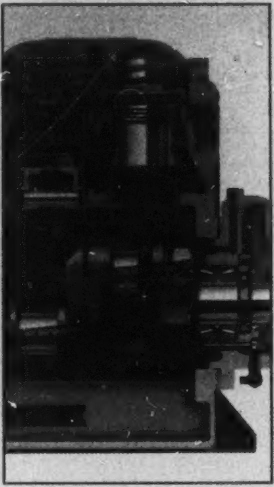
111 Applesauce processor gains by integrating technologies
118 Water treatment system benefits juice processor
122 Production temperature is key to longer salad shelf life
124 Membrane technology solves process discharge
126 Difficult choices in multitiered instrumentation
130 Customized continuous freezer increases production

New Equipment

139 Processing Equipment
149 Sanitation & Maintenance
158 Handling & Distribution



PROCESS CONTROL: PAGE 111



Special Emphasis

REFRIGERATION AND FREEZING

More and more refrigeration and freezing products have gained acceptance in the marketplace, as consumer demand for frozen products continues unabated.

Pages 101 to 108

STATE OF THE FOOD INDUSTRY

FOOD'S PERFORMANCE OVERSHADOWS WALL STREET LOSSES

The shock waves of the October 19 stock market "adjustment" reverberated through the economy. The food industry weathered the storm well, feeling the effects much less than other industries, and appears to have positioned itself to withstand further economic downturn.

If you were keeping score in 1987, it is plain to see that the food and beverage industry ended the year a winner, despite the curve ball the stock market hurled at the economy on October 19. Call it what you will, "Meltdown Monday" or "Black Monday," the far-reaching effects of the calamitous dive of the Dow Jones industrial average that day was felt less in the food and beverage industry than in some other economic sectors.

Joyce Fassl, Managing Editor; Linda K. Freeman, Contributing Editor; Charles E. Morris, Midwest Editor; Ann E. Przybyla, Technical Editor; Margie Russell, Senior Associate Editor.

STATE OF THE FOOD INDUSTRY

The strength that saw the industry through the stock market "adjustment" will serve it well in 1988 when the economy is expected to continue its slow pace and many feel a recession sometime in '89 is almost unavoidable.

A year of modest growth

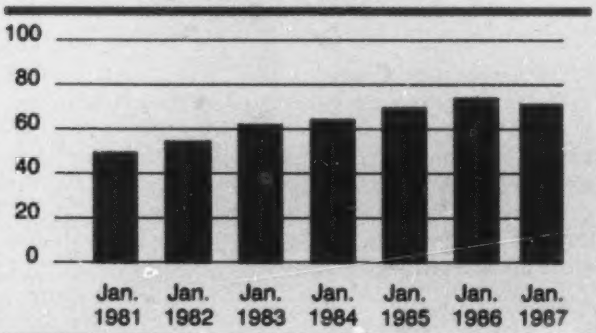
Despite the gyrations of the U.S. economy in the fourth quarter, the food and kindred products sector of the economy was able to realize a 1.7 percent growth rate in 1987, a feat not all sectors of the U.S. economy can claim. Growth was fairly uniform across the various industry categories within the sector, says the Department of Commerce in the U.S. Industrial Outlook 1988, with no one area booming, or showing significant decline.

Total personal consumption expenditures for all foods and beverages both at home and in restaurants increased 3.1 percent from 1986 to 1987, rising to $513 billion, according to the Outlook. Money expended for food and drink at home, however, grew only 1.7 percent to $339 billion. It was in personal consumption expenditures for restaurant meals and beverages where larger growth was realized. In 1987 there was a 6 percent increase (to $165 billion) over 1986. In a time when disposable income was tighter, Americans still continued to eat out.

Economic factors

How come the food industry didn't fall to its knees on October 19 when the stock market crash rocked the economy? There were a number of reasons, not the least of which was that the food industry had positioned itself well for a time of economic downturn. Economic conditions prior to the third quarter of 1987 helped the food industry hold its own. You couldn't call the year record-setting, but processors were able to raise their gross margins in spite of the market adjustment.

Weekly family grocery expenses 1981-1987



Source: Food Marketing Institute, "Trends Update: 1987 Consumer Attitudes & the Supermarket

Food expenditures compared against disposable personal income

(billions of current dollars)

Year	Disposable Personal Income	Food Expenditures	Percent
1966	$525.9	$109.0	20.7
1976	1252.6	236.2	18.8
1986	3022.1	497.8	16.5
1987	3181.5*	514.7*	16.2

*Preliminary
Source: Bureau of Economic Analysis; U.S. Department of Commerce

While it was true that food stock prices fell along with everything else on October 19, they rebounded after Black Monday. Harry Segalas, vice president and food analyst with Shearson Lehman Hutton in New York City, puts it this way: "In terms of the overview of the industry, one of the appealing aspects of the food companies is that these companies have a very high degree of earnings visibility in time of investor caution."

Tax reform certainly aided the processor, accounting for 20 to 30 percent after tax profit gains for the year. Although food prices didn't advance at the same rate as inflation, prices for commodities were lower which was also a boon to the processor. Branded processors, overall, continued to reap the rewards of a name known in the marketplace. The dollar value of a known brand name can't be written in a company's ledger, but its value cannot be underestimated.

Looking ahead

For the calendar year 1988, the Department of Commerce (DOC) is forecasting a better year than 1987. The DOC feels the aggregate real value of shipments by the 25 food and beverage industries covered in the U.S. Industrial Outlook for food and kindred products will increase about 2 percent, compared to less than 1.7 percent in real terms in 1987. This forecast is made despite many experts who feel that during the first six months of 1988 the economy will slow to less than a 1 percent real growth rate.

Why is it, then, with a forecast of weakness in the consumer sector of the economy and the prediction of slow growth overall, that the food industry is looking ahead with cautious optimism?

One reason is that through merger and acquisition activity the food industry has shed some of its periphery businesses and is moving back toward their core businesses. "When the downturn comes," says William Janis, an economist with the Department of Commerce, "they will be better prepared than had they remained conglomerates."

Another positive aspect is strong leadership in the food

STATE OF THE FOOD INDUSTRY

Food products balance of trade 1985-1987
($ millions)

	Exports	Imports	Balance
1985	$10,254	$15,976	$-5,722
1986	$11,485	$16,500	$-5,015
1987*	$12,568	$18,862	$-6,294

*Estimated
Source: U.S. Industrial Outlook 1988

industry, seen as being able to lead the industry forward even in times of economic downturn. "There is very strong, decisive leadership," says food analyst Segalas. "They understand their business and have given tremendous commitment to building brands...building volumes...while being a low-cost producer."

An example of such leadership is found at H.J. Heinz where Anthony O'Reilly is at the helm. For 23 consecutive years Heinz has increased its earnings, and stockholders have realized a positive return since 1974. *Value Line Investment Survey,* published by Value Line, New York, NY, expects Heinz's stock to continue to outperform the market averages in 1988 and feels the stock is a good investment through 1992. Kellogg is another strong food industry presence, having increased its earnings for 36 years in a row.

The "R" Word

Although there is no clear consensus among U.S. economists, there is a lot of serious talk about the inevitability of a recession. It is generally thought that it will not take place in 1988, but rather in 1989, presenting a whole new set of economic challenges to the food industry. What is generally agreed upon is that the economy will experience sluggish growth in '88, with the first six months seen as being the weakest in the year. It is expected that corporate profits will be up just slightly and a moderate 3-4 percent inflation rate will prevail. Overall it is expected that the gross national product will grow by only 2 percent during the year. After adjustment for inflation, this reflects the slowest growth since 1982, significantly under the rate in 1987.

Can recession be far behind? The jury is still out, but is weighted heavily in the forecast that a recession is inevitable. The question is the timing. "It is going to happen," says Janis of the DOC, "the question is when."

But all is not lost. "The food industry should weather the next downturn much better than a lot of other non-durable goods sectors. If nothing else, people have to eat, and if you are focused on your core industries you are going to be able to withstand the downturn," says Janis.

Richard Knowlton, chairman, CEO and president of George A. Hormel Co. feels confident about how the industry would weather a recession: "The food industry has always come through these times. Some people will get hurt, but generally speaking, the food industry has done well during recessionary periods and will do so again."

Food stocks strong

Food stocks have long been felt to be good investments. *Value Line* predicts that 1988 will be the eighth consecutive year that food stocks outperform the market averages. *Value Line's* data shows food group earnings per share up 74 percent from their 1980 level.

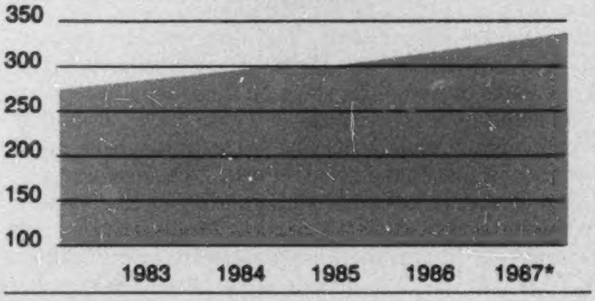
Segalas at Shearson Lehman Hutton shares *Value Line's* assessment of the strength of food stocks. Segalas feels that food stocks have had and will continue to have high earnings visibility, making them a good investment. "The pace of earnings will grow," says Segalas, "so we are going to see a growth of 10-14 percent on a nominal basis. With low tax rates, an increase of 15-20 percent is possible in 1988." Average return on equity is estimated to be in the 20-25 percent range, while Standard & Poor's stocks average about 15 percent, he says.

Mergers & acquisitions

One of the keys to the strength of food stocks and food industry finances is the strong viability of brand names. The industry has built up its brands over the years and is very conscious of the strength that lies in their recognition. In recent years one popular way to acquire a brand name and strengthen the company is through merger and acquisition.

In 1987 merger and acquisition activity continued at a rapid pace. Although the total number of transactions within the food industry was fewer in 1987 (599, as compared to 724 in 1986), the pace was still significant. Activity, says Frank Panyko, vice president, The Food Institute, "declined only temporarily when the stock market went

Food Industry shipments 1983-1987
(in $ millions)



*Estimated
Source: U.S. Industrial Outlook 1988

down, but it was very heavy toward the end of the year. In fact, there were some bargains out there." Panyko sees the pace continuing through 1988, saying activity "could be higher than 1987."

Borden has made sixteen acquisitions in 1987, according to Food Institute data, acquiring such diverse names as "Soup Starter" and "Stew Starter" from Beatrice's Hunt-Wesson Division, Blue Channel, a canned crab meat packer, DeJean Packing, a canner of shrimp products, as well as the Prince Co., pasta producers, two dairy businesses, a juice concentrate processor, and the flavorings business of Sunkist Growers Coop of California. Bordens also acquired pasta producers in Italy and Brazil and a bakery firm in West Germany.

Beatrice and RJR Nabisco each sold off some of their operations. RJR divested itself of Heublein, Winchester Little cigars, 50 percent of Nabisco Brands Espania, the Dromedary Food operations, Prince Albert and Carter Hall (a total of 4 tobacco plants) and Nabisco Brands Ltd. of Canada. Beatrice's divestitures included BCI Arrowhead Drinking Water Co., its 50 percent stake of Comabra to its local partners in Brazil, and in August the TLC Group limited partnership of New York paid $985 million for Beatrice International Food Companies, some 64 companies in 31 countries in all. Beatrice Foods of Canada Ltd. was sold by the TLC Group for $225 million to Onex Corporation of Toronto.

Foreign activity

Not to be overlooked is the 70 transactions which took place under the heading "Foreign Firms Buying U.S. Firms." Foreign companies realize the strength that can be added to their operations by acquiring well-known U.S. brand names. With the weakened U.S. dollar, foreign-based acquisitions made a lot of economic sense in 1987. And 1988 shouldn't be any different.

New products

Research and development activity and the introduction of new products have long been barometers of industry strength. If measured by that ruler, 1987 was an extremely good year. Marketing Intelligence Service (MIS) of Naples, NY posted 3,584 new food and beverage products introductions last year alone. The stock market readjustment of last October and the predicted slow economy of 1988 seems to have little effect on these activities.

Jim Blair, general counsel at Tyson Foods, feels that even though Black Monday adversely affected them, it will not affect the company's R&D efforts. "We are so committed to further processed products and we realize we have to have new products in the pipeline. That has become our reason for existence and we are not about to cut back on it." New product development will continue, he says, because "Once you get in our market position, you can't rest on your laurels, you have to hold onto your position."

Richard Knowlton of George A. Hormel concurs. "We are moving forward very aggressively," he says, "We don't have any thought of changing our direction. 1988 will see an increase in R&D and an increase in advertising budget expenditures."

Mergers/acquisitions 1984-1987

	1984	1985	1986	1987
Total Activity	583	658	724	599
By Industry Segment:				
Food Processors	89	95	114	109
Diversified Firms with Food Interests	48	39	57	37
Meat Packers	8	5	10	8
Poultry Processors	11	12	8	10
Soft Drink Bottlers	14	14	19	21
Dairy Processors	13	21	9	19
Foreign Firms Buying U.S. Firms	40	55	59	70

Source: The Food Institute

Variety & convenience

"A lot of what is driving new foods and beverages today is convenience and variety," says Richard Lawrence, president of MIS.

Microwave-specific or microwave-compatible foods respond to the need for convenience. It is projected that by 1990, 85 to 90 percent of all homes will have a microwave. Today, 50 percent of all workplaces make microwave ovens accessible. At home, the number of children who are becoming used to fixing their own snacks and meals in the microwave continues to grow, as does the number of men who are using the microwave. All of this creates a huge market for new microwaveable foods.

Convenient, and also growing in variety, are the increasing numbers of refrigerated foods available at the supermarket. Lawrence from MIS sees great consumer enthusiasm in this area. "There is no question that the consumer tends to equate freshness with quality and good taste and being better for you. Refrigerated products rank high on the scale of things which are indeed fresh."

Refrigerated, however, is still in the infancy stage. With the rapid growth in products and packaging being developed for this category comes some problems that will have to be addressed, not the least of which are some concerns about the microbiological safety of these products. Also, says Sue T. Borra, R.D., manager of consumer information with the Food Marketing Institute in Washington, D.C., "Refrigerated puts a new product in the hands of consumers and they have to learn to use it. There are a lot of concerns in this area that must be met, such as safety in packaging, education of the consumer, and quality control."

Nutrition awareness

The consumer has become far more educated in the past decade or so and appears to be paying more attention to what he eats. Jim Heimbach of the FDA Consumer Service in Washington, DC says that "80 percent of the consuming public is aware" of the links between diet and disease. And, more and more, it is affecting what is consumed. Today consumers seem to be checking labels and planning meals based on risk avoidance—avoiding the problems of high sodium content, or high cholesterol content.

In Food Marketing Institute's "1987 Trends" survey, 98 percent of 1,007 people studied indicated that consumers were most concerned with salt content, vitamin/mineral content and sugar content of products.

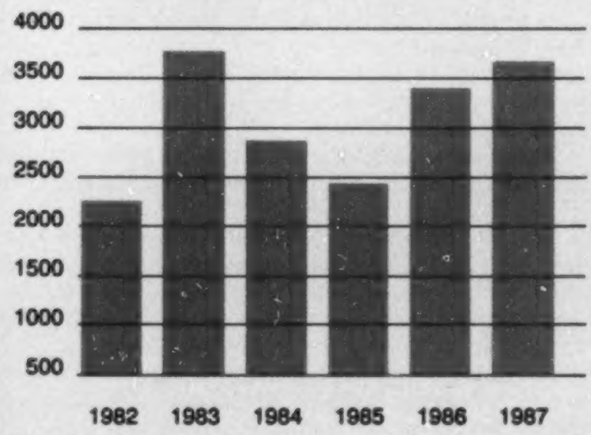
A trend that has not declined despite the sluggish economy is the public's willingness to pay for quality. "Quality is still number one," says Sue Borra, "Taste, nutrition, food safety—all come ahead of price and economy."

Challenges & opportunities

The major challenge that lies ahead for the food processor in 1988 is the ability to meet head-on the economic challenges of a slow economy and a predicted future recession.

Another challenge is to better adapt products and packaging to America's changing demographics. There are more and more households (estimated at more than half) that are headed by single persons, single parents or two working parents. It is important to meet their needs with different portion sizes, added convenience and better containers that will permit a product to go from the freezer, into the microwave, then directly to the table.

New Product Introductions



Source: Marketing Intelligence Service

Food products expenditures 1983 - 1987

Year	($millions)	% Increase
1983	$421,888	base
1984	448,453	6.2
1985	472,799	5.4
1986	497,802	5.3
1987	515,776	3.6

Source: Bureau of Economic Analysis, Department of Commerce

Gross national product 1983 - 1987

Year	($millions)	% Increase
1983	$3,405,700	base
1984	3,772,200	10.7
1985	4,010,300	6.3
1986	4,235,000	5.6
1987	4,487,700	6.0

Source: Bureau of Economic Analysis, Department of Commerce

"We have only begun to identify the many ways in which we think food will be consumed," says Knowlton of Hormel. "There are many prospects there for bringing flavorful convenience foods to consumers. This is an on-going exercise. You have to be flavorful first, and then have a strong commitment to being nutritional as well."

Lawrence at MIS sees a chance for processors to expand their profitability by looking at some other channels of distribution. "For example," he says, "in the refrigerated food business you would want to be in 7-Eleven stores, convenience stores where people are stopping to and from work to pick up that kind of thing to either eat it on the run, or take it home. You must take the food where the people are."

A significant opportunity, says Sue Borra, is for processors to increase their line of foodservice-type foods that will fit into the supermarket. "There is great expectations for growth in this area by 1990," she says. This will be a joint effort between the processor and the retailer to develop quality hot and cold foods "to go."

And there are exports. It is an opportunity that Tyson Foods has already taken advantage of. The company has been able to use overseas sales to combat some of the effects of a sluggish U.S. economy. "Our Japanese business is growing at a marvelous rate, starting, of course, from a low base. I think we will try to broaden the scope and enter other markets," says General Counsel Jim Blair.

Read on

In the following pages, *Food Engineering* will examine each segment of the food industry and analyze what happened in 1987, but also forecast what lies ahead.

There are challenges ahead, to be sure, but the U.S. food industry has proven itself able to accept and meet past challenges. The true test will be in being able to maintain its record of strength, profitability and innovation through a possible recessionary economy.

STATE OF THE FOOD INDUSTRY

SNACK FOODS

Snack food continued its steady grow in 1987. Manufacturers sales of nuts were an estimated $1.6 billion in 1987, up 6 percent over 1986. Salted snacks were up 9 percent over 1986 to an estimated $4.9 billion in 1987, according to Business Trend Analysts, Commack, NY.

Nominal dollar growth for the industry has been solid over the past ten years for salted snacks, with a yearly growth rate between 5.6 and 15.3 percent in a market that has more than doubled since 1977.

The country's most popular snacks continue to be potato chips made from potato slices and the fabricated variety made from dried potatoes. These snacks account for almost half of the industry's sales. In second place are corn chips, including tortilla flavored chips, with about 20 percent of market share. Salted nuts have 14 percent of the market, followed by extruded snacks, meat snacks, and pretzels which each have about 5 percent.

The manufacturers sales of salted snacks are expected to more than double to $11 billion by 1996, with an annual growth of 3.5 percent.

The realm of snack foods available has widened due to changing demands from consumers. Buyers are demanding more gourmet items, and at the same time they are demanding more healthy items. The population is getting older, and less people are eating the traditional three meals a day at home.

The overall composition of U.S. population has become bigger in the middle and older aged segments. Consumer preferences are increasing for products high in quality and nutrition, perhaps a result of the health and fitness craze. The emergence of more working women and mothers has led to an on-the-go, fast-paced lifestyle which calls for more convenience foods, including snacking foods.

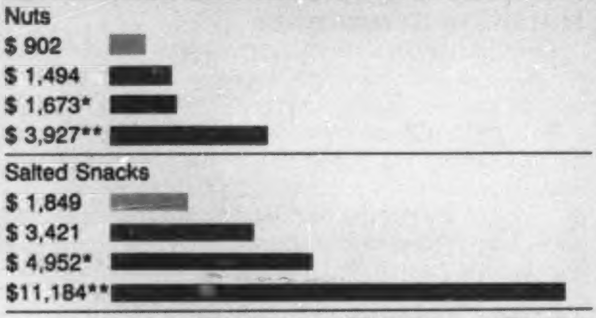
Even fast food restaurants are affecting the snack food market. Drive-in windows make snacking convenient. So products such as McDonald's Chicken McNuggets have become popular snacking items.

Gourmet, or up-scale products, have achieved a lot of popularity, despite their higher price tag. Since the population is getter older, many of these consumers have more disposable income and are willing to pay the price for higher quality gourmet items.

In addition to a bigger choice of snack foods, consumers are currently experiencing a wider array of snack food flavors and tastes. Mexican style remains popular, with jalapeno and salsa seasoning cropping up more and more in certain snack foods. Snack food manufacturers have acted on the consumer desire for spicy flavored snack food items by extending product lines that employ spices not normally used in snacks.

At the Snack Food Association show, Snaxpo, held in Dallas in March, the spicy and exotic trend is continuing. Many observers think that Mexican is clearly here to stay, not a passing fancy. On the other hand, Cajun, though popular recently, is not here to stay, according to many industry followers. The new snack flavors on the horizon, as seen at Snaxpo, will be Caribbean and new and exotic oriental flavorings, especially Thai. Another possibility is tomato flavor, which is now very popular in Canada as a potato chip flavoring.

Snack foods sales
(in millions of dollars)



*estimated **projected
Source: U.S. Department of Commerce; Business Trend Analysts, Commack, NY.

In the healthy snack food market, the only winner is the fruitbars segment which has exploded recently (for example, *Fruit Wrinkles* from General Foods, and Thomas Lipton's *Fruit Nibbles*). While this segment is growing, the traditional healthy snack, the granola segment, is showing no signs of growth.

According to Find SVP, New York, NY, healthy snacks are those perceived by the consumer as healthy. They include granola bars, dehydrated snacking fruits, fruit rolls/bars/bits, plain pre-popped and microwaveable popcorn and bulk snacks and trail mix.

The challenge facing healthy snack marketers is how to mainstream their products to appeal to more than those people who shopped in the health food stores of the '60s and '70s.

As proven by the failure of the granola bar, enrobing healthy products in chocolate or other candy-like ingredients was not successful, Find/SVP says. The future for healthy snacks, granola bars and fruits roll types snacks is not particularly optimistic.

On the other hand, all types of popcorn are expected to grow to $788 million dollars in 1991 from $318 million in 1986.

Nuts have always been perceived as one of the more nutritious snack foods available since they often contain calcium, phosphorus, iron, potassium and various vitamins. The majority of nuts are low in saturated fats and contain no cholesterol. This segment of the snack food market has grown tremendously from under $400 million in 1970 and is expected to grow to close to $4 billion by 1996. This prediction depends greatly on large harvests, says BTA.

All in all, the healthy snack food market is expected to increase by about 4 percent yearly.

STATE OF THE FOOD INDUSTRY

DAIRY PRODUCTS

While the overall dairy category saw only modest growth in 1987, several products within this category faired much better. Adjusted for inflation, dairy shipments rose only 0.6 percent in 1987, according to the U.S. Industrial Outlook, 1988. Frozen yogurt, butter, and ice cream were among the big winners in 1987.

The dairy category is divided into five categories by the U.S. Department of Commerce: Fluid milk, butter, natural/processed cheese, condensed/evaporated milk, and ice cream/frozen desserts.

Fluid milk: The increasing popularity of 1 percent lowfat milk was a key factor in the 5 percent gain of per capita use of lowfat milk in 1987. On the other hand, per capita consumption of fluid whole milk dropped from 121.57 pounds per person in 1986 to 118.57 in 1987.

In an effort to address the problem of surplus milk, the government bought 1.6 million cattle from dairy farmers for $1.83 billion from April 1986 to September 1987. This did result in decreased milk production temporarily. But with the lure of all surplus output of milk being bought at support level by the government, dairy herds are being expanded. For example, The Texas Agricultural Experiment Station reports that Texas is now producing more milk per herd than ever.

Butter: The first rise in per capita butter consumption in several years was seen in 1987. The U.S. Industrial Outlook 1988 reports a 4.7 pound per capita consumption of butter in 1987—a 2.1 percent increase over the previous year. The Outlook credits several factors for the increase: Stable prices, renewed consumer preference for richer foods, and increased advertising.

Natural/processed cheese: Cheese consumption is expected to increase to 26.04 pounds per capita in 1991, predicts the United Dairy Industry Association (UDIA). This would be a 4.8 percent increase over the 24.84 pounds per capita consumption in 1987.

The UDIA also pointed out that per capita consumption of mozzarella has soared more than 70 percent over the last five years, and is projected to continue its upward climb. "The Italian cheese category benefited tremendously from the growth of pizza sales both in the foodservice and grocery segments; interest in cooking and eating out also led to wider experimentation with ethnic cheese varieties," says Gerald Quackenbush, UDIA market research consultant.

Still, the top choice among sliced cheeses is American, comprising a 72.3 percent of the sliced cheese market, according to Stamford, CT-based MRCA Information Services. It was also pointed out that parmesan topped the grated cheese market, with a 66.2 percent share.

Other findings in a new study by MRCA, *Cheese: A Marketer's Guide to Consumer Purchasing*, include:

- Average price per pound of cheese remained stable at $2.36 from 1985/86 to 1986/87.
- Low fat/low calorie cheese posted a dramatic increase, up 22 percent in volume purchased between 1986/87 and the previous year.
- Imitation cheese declined 16 percent in volume in 1986/87 from the previous year.

Per capita consumption of select dairy products 1987 (lbs.)

Creamed Cottage Cheese	2.81
Lowfat Cottage Cheese	1.07
Yogurt	4.25
Skim Milk	12.30
Lowfat Milk	89.00
Fluid Whole Milk	118.57

Source: U.S. Department of Commerce

Condensed/evaporated milk: Valued at $3 billion, estimated commercial sales of canned/dry milk accounted for 51.2 percent of 1987 products shipments, down from 70.1 percent in 1982, according to the U.S. Industrial Outlook 1988.

Ice cream/frozen desserts: The biggest growth in this area was experienced by frozen yogurt. "In 1987, frozen yogurt woke up everybody—I'm expecting to see more introductions in this category," Howard Waxman, editor of Find/SVP's *The Ice Cream Reporter*, told *Food Engineering*. Growth of frozen yogurt began with expansion of soft serve products, with hard frozen yogurts now becoming more prevalent.

Preliminary USDA figures for overall ice cream production for 1987 showed a 0.7 percent increase, compared to 2.5 percent increase for 1985 to 1986. The market was inundated with new super-premium ice cream products in 1987, yet growth in that area is slowing down, reports Waxman. Earlier predictions for super-premium ice cream called for continued double digit growth in 1987, yet the larger growth came in the more "healthy" frozen yogurt category. The leaders in super-premium category such as Häagen Dazs and Ben & Jerry's continue to do well, though.

Häagen Dazs' Macadamia Brittle was selected by *USA Today* as the Best New Ice Cream in 1987. Macadamia Brittle, along with Chocolate chocolate mint and Mocha double nut make up the Special Additions line. The company recently announced the introduction of Häagen Dazs Bar with milk chocolate and roasted almonds coating.

The first aspartame-sweetened frozen novelties were introduced in 1987, with more expected in 1988. But the overall category of miscellaneous combinations of fudge bars, pudding pops, and frozen yogurt mixes saw a 21.6 percent plunge in 1987, according to U.S. Industrial Outlook.

"There always will be a demand for something new in the ice cream industry—people have come to expect it," concluded Waxman.

STATE OF THE FOOD INDUSTRY

BAKERY PRODUCTS

The bakery products industry had a relatively good year in 1987. The cookie segment of the industry showed the greatest increase in per capita consumption where 10.90 lbs. were consumed in 1987 as compared to 10.64 lbs. in 1986. White bread consumption had a very slight decrease—45.22 lbs. in 1987 compared to 45.26 lbs. in 1986 (U.S. Industrial Outlook). Real shipments of baked goods remained the same as 1986, although the Outlook reports that constant dollar shipments of bread and cakes slipped 0.3 percent but the shipments of cookies and crackers rose 0.9 percent.

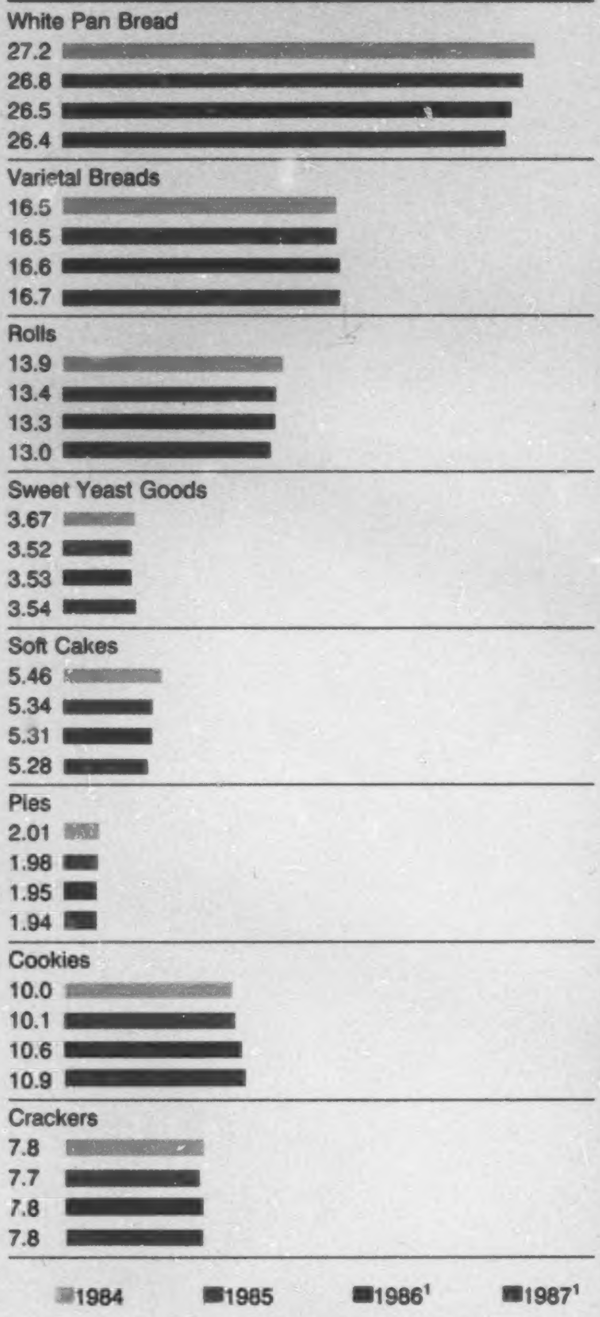
The sales of bakery products reached $22.5 billion in 1987, reports Business Trend Analysts, Commack, NY. Bread and bread-type products command the market for baked goods, accounting for 40.9 percent of sales. Cookie and cracker sales captured more than one-third of total bakery product revenues for 1987. Cake and cake-type items accounted for 16.3 percent while frozen baked goods accounted for 8.2 percent of sales.

A new wave in the bakery products industry—in-store bakeries—has meant severe competition to manufacturers' sales figures. The number of in-store bakeries has more than doubled since 1980, reaching an estimated 20,203 in 1987, reports Business Trend Analysts. Estimated sales of such bakeries topped $5 billion in 1987, compared to $2.1 billion in 1980. The real trouble for bakery product manufacturers is that often retailers with an in-store bakery take much of the shelf space formerly given to the producer in order to emphasize products sold through the in-store unit. Bakery product manufacturers have also seen competition from bakery mixes and refrigerated bakery product doughs.

Going along with the consumer interest in health and fitness, the bakery companies have seized the opportunity and introduced products that are perceived by consumers to be more nutritious than white breads. Variety breads such as wheat, sourdough and pumpernickel are claimed to be high in fiber, vitamins and minerals, and have attracted much consumer attention in the past several years.

In addition to variety breads, manufacturers have also used the reduced-calorie eating trends to introduce "light" bread varieties. These breads usually have 40 calories per slice and a number of new products were introduced within the last year: Arnold Foods' "*Arnold Bakery Light Bread*"; Dillons' "*Olympic Meal Light Bread*"; and Orts' "*Liter 35*" bread line, to name a few.

The cookie segment of the bakery industry has also seen a shift toward marketing new products that convey a healthy image to the adult consumer. These products are made with no preservatives and contain natural ingredients such as fruit, nuts, granola, and whole grains. One example is the *Americana Collection* from Pepperidge Farm which is a line featuring bits and chunks of fruit and nuts, in eight-cookie, single-serving packages, according to Packaged Facts, The Information/Research Company, New York, NY.



Per capita consumption of bread and related products
(in pounds)

[1] Estimated by the International Trade Administration.

Source: U.S. Department of Commerce, U.S. Industrial Outlook, 1988.

STATE OF THE FOOD INDUSTRY

CANNED FOODS

Although per capita consumption of canned vegetables edged-up in 1987, consumption of both canned fruits and vegetables continues to decline long-term in favor of fresh and frozen. According to the Department of Commerce (DOC), the only "canned" sectors sustaining growth are ethnic foods, sauces/dressings, soups and aseptic juices. As a percentage of total fruit/vegetable consumption, per-capita consumption of canned fruits and vegetables slid from 35 percent in 1972 to 28 percent in 1986 while fresh produce increased market share from 52 to 55 percent and frozen from 13 to 17 percent over the same period.

Although the value of shipments in the canned sector rose 4.6 percent in 1987 to $23.4 billion, DOC reports, constant dollar shipments rose only 0.6 percent.

When it comes to canned vegetables, there seems to be something of a dichotomy in consumer perceptions: Canned vegetables are more convenient than fresh vegetables but less nutritious than either fresh or frozen vegetables. "The outlook for use of both canned and freezing vegetables depends upon consumers' continued desire for convenience and their perception of the nutritional value of processed vegetables," said USDA Economist Shannon Reid Hamm at USDA's Outlook '88 conference last December in Washington, D.C. "However, the trend in processing use has favored freezing over canning, except for tomatoes."

Per-capita consumption of canned vegetables edged-up in 1986 to 82.1 lbs. from 81.4 lbs. in '85 while per-capita consumption of frozen vegetables slipped a bit to 17.2 lbs. from 17.6 lbs. a year earlier. But this seems to be a seasonal aberration; the long-term trend is down. Since 1980, according to USDA, per capita consumption of fresh vegetables jumped 9.5 lbs.—from 80.7 lbs. in 1980 to 90.2 lbs. in 1986—while per capita consumption of frozen vegetables surged from 15.7 lbs. to 17.2 lbs. and canned vegetables slid from 84.6 to 82.1 lbs. over the same period.

Per-capita consumption of fruits continues to trend-up along with nutrition concerns but—as with vegetables—it's the fresh and frozen segments that have gained as the canned segment continues to decline. According to USDA, per-capita consumption of fresh fruit grew steadily over the past five years from 209.1 lbs. in 1983 to an estimated 216.2 lbs. in 1987. Per-capita consumption of frozen fruits peaked at 84.7 lbs. in 1985, then fell-back to 83.2 lbs. last year. The trend for canned fruits, however, has been steadily down—from 19 lbs. per capita in 1983 to 16 lbs. per capita in 1987. Outlook for processed fruits: "Per-capita consumption of canned, frozen, chilled and dried fruit is expected to remain relatively steady," said USDA Economist Ben W. Huang, at Outlook '88. For non-citrus fruits the outlook is mixed, Huang continued. Bigger crops of apples, Clingstone peaches, Bartlett pears and cherries should result in more canning of these fruits than in '87.

According to DOC, shipments of prepared soups have grown at an annual rate of about 5 percent after plateauing in the early '80s. Dry soups and microwaveable ready-to-serve soups lead the trend. Aseptic juices haven't peaked yet and will grow "by at least 6 percent in 1987," said DOC.

Overall outlook: "Canned" food shipments will grow by about 1.1 percent in 1988, according to DOC, but the growth will be in sauces/dressings, ethnic foods and aseptic juices.

Aluminum cans still account for only about 5 percent of canned foods (as compared to 95 percent of canned beverages) but new aluminum can-making technology may put at least a dent in steel's dominance of the can market.

Trends & forecasts: canned foods[1]

($ million except as noted)

						percent change		
INDUSTRY DATA	1984	1985	1986[2]	1987[3]	1988[4]	85-86	86-87	87-88
Value of shipments	21,756	22,712	22,401	23,421	-	-1.4	4.6	-
Value of shipments (1982$)	20,157	20,864	20,419	20,543	20,777	-2.0	0.6	1.1
Total employment (000)	128	128	130	132	133	1.6	1.5	0.8
TRADE DATA								
Value of imports	1,708	2,062	1,831	1,847	-	-11.2	0.9	-
Value of exports	558	533	593	667	-	11.3	12.5	-

[1] SIC 2032, 2033, 2034, 2035 [2] Estimate except imports and exports [3] Estimate [4] Forecast

Source: U.S. Department of Commerce

STATE OF THE FOOD INDUSTRY

BREAKFAST CEREALS

The breakfast cereal industry had another good year in 1987. Sales for cold-ready-to-eat cereals were over $5.3 billion for the year, an increase from 1986 sales of $4.9 billion, reports John C. Maxwell, Jr. of Wheat First Securities, Richmond, VA. Part of the increase in sales most likely came from a three percent price increase that was put into effect in the first quarter of the year.

Production costs stabilized which helped moderate increases in producer and consumer cereal prices during the year, according to the U.S. Industrial Outlook, published by the Department of Commerce. Per capita consumption for cereal rose again in 1987, up slightly from 1986 – from 14.8 lbs. to 15.2 lbs. – an increase of approximately three percent. Specifically, ready-to-eat cereal consumption increased from 11.3 lbs. to 11.6 lbs.

The cereal industry, it must be noted, is highly concentrated among five chief competitors which hold an estimated 82.7 percent of the market. The order: Kellogg is the leader at 35.9 percent, General Mills, 19.8 percent, General Foods, 12.6 percent, and Ralston Purina and Quaker Oats tied at 7.2 percent (U.S. Industrial Outlook). On a specific note, Maxwell reports that Kellogg gained a few shares in the market in 1987 while at the same time, General Mills lost some shares.

Fiber still seems to be playing an important part in the composition of cereal foods again this year. The popularity of fiber and the marketing wars among the major cereal producers are very much evident in the industry this year as in the past two years. SAMI/Burke, Inc. (New York, NY), reports an increase of 8.9 percent in retail sales of all cereals this year. In particular, cereals containing fiber/bran rose 6.1 percent this year, with sales at $795 million compared to 1986 figures of $749 million.

U.S. Industrial Outlook reports consumers between the ages of 25 and 49 show a preference for bran, fiber, high-nutrition and multi-grain cereals. In 1987, Kellogg spent $33 million to promote an adult cereal, *Mueslix*, fashioned on the Swiss cereal, *muesli*, which is a combination of barley, corn, oats, rice, and wheat.

It is interesting to watch the trend of hot cereal consumption by the American public. It has been steadily rising over the past seven years and 1987 was no exception. Per capita consumption was up from the previous year to 3.60 lbs. as opposed to 3.53 lbs.

The market for hot cereals, though, has always been chiefly limited to young children and older adults. This year, the marketing for hot cereals changed, however. New flavors, convenience, and ease of preparation – especially in microwaves – have all swung the marketing direction of hot cereals to more adults.

Quaker Oats, long the leader in the hot cereal industry with 68 percent of sales, began a massive advertising campaign in 1987 to defend its share of the market. The company wanted to promote its oatmeal line to the average adult but also found itself fighting off a new contender in this market – General Mills. It is estimated that Quaker Oats will spend $45.6 million to defend its frontrunner status in the $500 million hot cereal market before the year is out.

Per capita consumption of breakfast cereals (estimated in pounds per person)

Category	1982	1983	1984	1985	1986	1987
Total[1]	12.59	12.95	13.59	14.48	14.87	15.27
Ready to Eat	9.41	9.71	10.20	11.02	11.34	11.67
Corn	3.04	3.10	3.25	3.36	3.46	3.57
Wheat	3.10	3.17	3.31	3.42	3.51	3.61
Rice	1.19	1.21	1.27	1.31	1.34	1.37
All other except Baby cereal	2.08	2.23	2.37	2.93	3.03	3.12
Hot cereal	3.18	3.24	3.39	3.46	3.53	3.60

[1] Totals based on production and exports but not imports.

Source: U.S. Department of Commerce, Bureau of the Census and International Trade Administration (ITA).

Product shipments of cereal breakfast foods (in millions of dollars)

Industry	1982	1983	1984	1985	1986[1]	1987[1]
Total	3,111	3,398	3,870	4,379	4,821	5,342
Ready-to-serve	2,775	3,032	3,452	3,906	4,316	4,787
Hot Cereals	330	360	410	464	496	545
Unspecified items	5.5	6.0	6.9	7.8	8.5	9.4

[1] Estimated by International Trade Administration (ITA).

Source: U.S. Department of Commerce, Bureau of the Census and International Trade Administration (ITA).

Besides large media efforts, Quaker Oats is also promoting its hot cereal line several other ways: putting samples of instant oatmeal inside boxes of cold cereal, coupons, and game cards.

The challenger to Quaker Oats, General Mills, entered the hot cereal market with its new *Total Oatmeal*. U.S. Industrial Outlook reports General Mills supported it product with a $24 million advertising budget.

An interesting anecdote on how competitive this industry really is: the above-mentioned rivalry between Quaker Oats and General Mills was not only just for market share. When General Mills announced its new line, Quaker Oats filed a suit alleging a trademark violation by the other company. When the court decision was made in the form of a consent decree, General Mills agreed to stop using part of Quaker Oat's logo.

STATE OF THE FOOD INDUSTRY

MEAT & POULTRY

As predicted last year by USDA, 1987 per-capita consumption of poultry surpassed that of beef for the first time in history and the trend will accelerate. The adverse impact of last year's *60 Minutes* "exposé" of Salmonella on poultry was short-lived: Per-capita consumption of poultry (chicken plus turkey) totaled 77.7 lbs., surpassing beef by 2.5 lbs., and USDA projects per-capita poultry consumption soaring beyond beef by an astonishing 10.9 lbs. this year. Major reason: Consumer concerns about diet and health. Price and convenience are factors, too: Poultry is not only less expensive than beef but is used in a wider variety of frozen entrees and other convenience foods.

According to the Department of Commerce, overall value of meat shipments rose 4.3 percent in 1987 to $69.7 billion but adjusted for inflation declined 1.2 percent. Red-meat shipments fell more than 2 percent to $56.7 billion ($42.5 billion fresh meat, $14.2 billion sausage and prepared meats), while the value of poultry shipments rose 5.3 percent (5.8 percent in constant dollars) to $13 billion. Red-meat production fell 2.2 percent to 38.2 billion lbs. as poultry production soared 9.8 percent to a record 20 billion lbs. Red meat accounted for about 81 percent of the value of all meat industry shipments, down 4 percent since 1982.

Feed prices declined but beef and pork producers tightened supplies to keep prices up. During the first six months of '87, consumer prices for beef and pork rose 6.8 percent and 14.1 percent respectively, and consumer prices for poultry rose 9 percent due to strong demand But "it appears that the long-awaited buildup of the nation's cattle herd has begun," said American Meat Institute Chairman Kenneth W. Montfort, now president of ConAgra's red meat division since ConAgra's purchase of Montfort of Colorado earlier last year, at the AMI convention last October in Chicago. "Likewise, pork producers are expanding their production. We believe beef and pork will continue to be mainstays of the nation's diet."

Convenience trends in poultry include new products such as: "Perdue Done It!" fully-cooked microwaveable chicken parts in a controlled-atmosphere package (CAP); Tyson marinated chicken-breast filets; and ConAgra Mexican-style boneless seasoned chicken strips.

Red-meat packers may have been slower to develop convenience products but are on the move with innovations such as vacuum-packaged, closely-trimmed branded fresh beef with extended refrigerated shelf life (EXCEL); CAP-packaged branded fresh pork cuts (Wilson and Thorn Apple Valley); CAP-packaged fresh lamb (Rocco) and frozen veal (Provimi); shelf-stable entrees in retortable plastic (Top Shelf from Hormel); fully-cooked, microwaveable frozen pork chops, pork-sausage patties and egg/bacon biscuits (New Tradition, from Hormel). Vac-pack and CAP technologies are accelerating the trend toward centralized retail meat cutting at the packer level for greater economies of scale than can be achieved by retailers. Prepacked retail cuts further offer better yields for the retailer, less re-work at store level and allow the retail meat cutter "to become more of a salesman," observed William Fielding, president of EXCEL. Retailers and consumers are accepting vacuum-packaged fresh-beef cuts, Fielding added, "but we need to convince the retailer to take a lower gross margin – 10 percent rather than 20, for example."

Meat & poultry per capita consumption (lbs.)

	Beef	Pork	Chicken	Turkey	Veal	Lamb	Total
1985	78.8	62.0	57.6	12.1	1.8	1.4	213.7
1986	78.4	58.6	58.8	13.3	1.9	1.4	212.4
1987	75.5	58.9	62.5	15.2	1.5	1.3	214.9
1988[1]	71.8	62.6	65.3	17.4	1.5	1.3	219.9

[1] Estimate

Source: USDA (February 1988)

The beef industry is cutting the fat out, noted outgoing AMI Chairman Richard L. Knowlton, president and CEO of Hormel. AMI and the National Cattlemen's Association jointly petitioned USDA last year to uncouple yield and grading, Knowlton reported. This would enable packers to trim carcasses on the slaughter floor, meeting consumer demand for well-trimmed beef while cutting energy costs for packers. More trim by packers, combined with the quarter-inch trim program adopted by most retailers and the recent grading change of USDA Good to USDA Select "will enhance the image of leaner beef," added Montfort.

Producers have already taken a year off the slaughter age of cattle and have developed bigger cattle with less fat, Montfort continued. "Through herd selection today and genetic engineering tomorrow, we're converting more feed to meat and less to fat," said Montfort.

Mergers, acquisitions and divestitures are reshaping the meat industry, as elsewhere. 1987 highlights: Occidental Petroleum sold 49 percent of IBP – now the nation's largest pork packer as well as the largest beef packer – through a public offering; ConAgra acquired Montfort, E.A. Miller & Sons and 50 percent of Swift Independent Corp., boosting ConAgra from tenth to third largest meat company in the U.S. But new faces are emerging, too, Knowlton noted. "Today there are specialists in every sector, particularly fresh meat," he observed. "Others are directing themselves toward the sausage business, still others toward smoked and processed meats...dry sausage...deli and pre-packaged luncheon meats. Specialists are finding success catering to the many niches within the market."

Measured in constant dollars, red meat production will rise about 1.7 percent in 1988, says USDA, with beef falling 4 percent but pork production rising about 10 percent. Per-capita pork consumption will rise nearly 5 lbs. this year due to larger supplies and lower prices. Poultry production will surge 5.1 percent and per-capita poultry consumption will increase from 36 percent of total meat consumption in 1987 to 40 percent by 1992.

STATE OF THE FOOD INDUSTRY

CONFECTIONS & DESSERTS

People are trading truffles (especially oversized ones) for turtles and fudge, says Joan Steuer, president of New York-based Chocolate Marketing. While the overall confectionery category is healthy, sales of super-premium chocolates (those over $20/lb.) are declining. This is partly due to the increased availability of regional chocolates at a lower cost, explains Steuer.

Despite health concerns, the candy market is expected to continue its upward climb. Packaged Facts in its report, *The Candy Market*, predicts the overall confectionery market should grow at an average annual rate of 1.9 percent, reaching 5 billion pounds by 1995. Nonchocolate candy volume should grow faster than chocolate volume, the report continues to point out.

Concerning negative attitudes towards sugar, The Candy Market report says, "Robust candy sales, the sweetest of all snacks, over recent years certainly calls into question any casual relationship between consumer attitudes and actions with regard to the sweet white substance (sugar)." And according to Market Research Corporation of America (MRCA), even those who identify themselves as dieters are allowing themselves 46 percent more chocolate bars as in the early 1980s.

A recent study by M&M/Mars (a company which along with Hershey holds 36 to 38 percent of the candy market) pointed out that confectionery in the U.S. is generally perceived as a taste treat rather than used to relieve hunger. They are being positioned more as a permissible snack food for inclusion in a regular diet.

The National Confectioners Association, along with several other confectionery associations, has distributed a pamphlet on how candy can fit into a fitness program. The pamphlet shows how to estimate one's daily caloric requirements, and how some of these calories can come from confectioneries. Charts showing the number of calories in a variety of confectionery products and how many calories are consumed by various activities are provided.

A number of trends within the confectionery market were noted by Chocolate Marketing's Seuer. "We're seeing more larger size chocolate bars both because of a commodity surplus of cocoa and because people are finding dual uses for chocolate bars," says Seuer. "Consumers are using chocolate bars to bake with more and more, rather than just eating them plain since, like with wine, some consumers have decided that if it isn't good enough to eat or drink then it isn't good enough to cook with."

Chocolate candy consumption is slightly ahead of nonchocolate consumption. The U.S. Department of Commerce reports total chocolate candy consumption for 1987 at 2.4 billion pounds or a 4.3 percent increase over the previous year, while nonchocolate consumption for the same period is 2.1 billion pounds or a 5 percent increase.

Elegant desserts haven't completely disappeared, though. Truffle Kits are becoming more prevalent, as is European positioning of desserts in general. A particularly novel new dessert was recently introduced by Gourmet International Foods, Inc. *Mousse Eclat* is an aerosol mousse which comes in an 8 ounce can and retails for $7.00.

Projected manufacturers' candy pound volume: 1986-1995
(in billions)

Year	Total*	% change	Chocolate	% change	Non-chocolate	% change
1995	5.03	2.2	2.62	2.0	2.17	2.5
1994	4.92	2.1	2.57	2.0	2.12	2.5
1993	4.82	2.3	2.52	2.0	2.07	2.5
1992	4.71	1.7	2.47	2.0	2.02	2.0
1991	4.63	1.0	2.43	1.5	1.98	2.0
1990	4.55	2.0	2.39	1.5	1.94	2.0
1989	4.46	2.0	2.35	1.5	1.90	1.5
1988	4.41	1.4	2.32	1.0	1.88	1.5
1987	4.35	1.4	2.29	1.0	1.85	1.5
1986	4.29	-	2.27	-	1.82	-
Average annual rate		1.9		1.6		2.0

*Total includes average of 5% for candy sales not specified by kind.

Source: Packaged Facts.

A major factor in determining the future health of the candy and dessert market will be estimating the price and availability of sugar. "Fortunately, the 1980s have been a period of relative calm in the world sugar market, particularly in comparison with the turbulence of the late 1970s. At present, sugar prices are relatively stable and seem likely to stay that way for the foreseeable future," states Packaged Facts' candy report.

Chocolate products are also dependent on cocoa supply. "With only a handful of countries supplying the cocoa needs for the entire world, extreme weather conditions or political unrest in any one of the key producing nations can affect the world market," states Packaged Facts' candy report. The report continues to point out that even nonchocolate candy sales are affected by the cocoa market, since dramatic shifts in chocolate candy prices could have a reverse effect on the price of nonchocolate candies.

Other uncertainties in the confectionery market could be caused by the fact that the U.S. Industrial Outlook 1988 predicts two or more candy manufacturers will merge or be acquired by foreign firms during 1988.

Some opportunities for candy manufacturers still remain. These will be in the areas of "natural" products, individually wrapped items, and sweet/salt combinations, says Seuer. Individually wrapped items offer convenience and a quick pick-me-up, and they have fewer calories than a larger item.

STATE OF THE FOOD INDUSTRY

DRESSINGS & SAUCES

Being calorie conscious and consuming sauces and gravies—particularly those of the ethnic variety in great quantities—are two trends the American public appears to be following unabated. The first trend is quite evident in the dressing segment of the food industry where sales of low calorie/reduced calorie salad dressings have risen significantly while sales of higher-calorie dressings and condiments fell over the past several years. The second trend is evident in the sauce market, where steadily rising sales are seen, particularly in the ethnic types like Italian, Cajun and Creole.

The sauce and gravy market often reflects trends in American eating habits and with the many new product introductions, FIND/SVP (New York, NY) reports this market reached profits of $2.9 billion in revenue in 1987. New product introductions in 1987 numbered approximately 200, according to FIND/SVP. This number is up significantly from 1985 when 128 new sauces and gravies were introduced to the market. Italian sauces held the largest share of this market in 1987, followed by meat and poultry sauces (including barbecue, steak and other meat sauces), dry sauce and gravy mixes, and Mexican sauces. The remaining categories in this market are liquid gravy, soy sauces, and hot sauces.

Sales figures indicating the trend the consumer is following in reducing calorie consumption can be seen in the decreased sales of old-standby condiments such as mayonnaise and ketchup. Mayonnaise sales, according to Selling Areas-Marketing/Burke Inc. (SAMI), New York, NY, have decreased to $630 million for 1987, compared to $658 million for 1986, a change of -3.7%. Ketchup sales decreased also, $500 million in 1987 as compared to $515 million in 1986, a change of -2.6%.

Other condiments, however, are showing good areas of growth, namely mustard and barbecue sauces. These items are probably showing increased sales because of their lower calorie content as compared with a condiment such as mayonnaise. For example, prepared mustard showed a slight increase of 1.1% ($186 million in sales) from 1986 sales ($184 million in sales). SAMI also reports a retail sales volume for barbecue sauce at $320 million for 1987, up 2.2% from 1986. The barbecue sauce market is somewhat dominated by one leading company, Kraft, whose product lines account for 50 percent of all sales. FIND/SVP also reports that Campbell Soup recently acquired *Open Pit* brand which accounts for 12 percent of sales. Hunt-Wesson's *Hunt* brand has a 10 percent share, and H.J Heinz Company has 7 percent. Durkee-French Foods (*Chris & Pitts* brand) and Geo. A. Hormel (*Old Smokehouse* brands) each have a three percent share of the market. Clorox Company has a somewhat new entry into the market, *K.C. Masterpiece*, and holds a two percent share, according to FIND/SVP.

Sauces, dressings, and condiments
(dollar value in millions at retail)

	1986	1987	% change
Mayonnaise	$658	$630	-3.7%
Spoonable Dressings	$401	$390	-1.9%
Pourable Dressings	$673	$683	+.7%
Low/Reduced Calorie Dressings	$146	$170	+13.0%
Ketchup	$515	$500	-2.6%
Prepared Mustard	$184	$186	+1.1%
Meat Sauce	$204	$219	+5.5%
Italian Food Sauce	$893	$971	+7.4%
Liquid Gravies, Sauces	$170	$182	+5.8%
Dry Gravies, Seasoning, Sauces and Mix	$328	$354	+5.8%

Source: Selling Areas-Marketing/Burke, Inc., New York, NY

The largest segment of the ethnic foods market and the ethnic sauce market is Italian food, according to Business Trend Analysts, which reports that Italian sauces are fourth in sales among all ethnic foods. The market for Italian sauces reported by BTA for 1987 was $766.3 million as compared with 1986 sales of $705.0. Italian sauce was 12% of total manufacturers' sales in 1987.

Spaghetti sauce is the largest category within this market, accounting for 88.1% of industry sales. FIND/SVP reports Chesebrough-Pond's *Ragu* as the industry leader commanding almost 50 percent of the market. Campbell Soup's *Prego* lines are in second place with 25 percent of the market share. Prince Company (*Prince* and *Classico* brands) has about 10 percent of the market.

Nontomato sauces account for 9.0% of sales, while pizza sauce accounts for 2.9% of sales. Trends in this market include introductions of premium and superpremium products and nontomato sauces.

Cajun and Creole foods have become the fastest growing new areas of the ethnic foods market. BTA indicates several large processors have jumped on the Cajun/Creole sauce bandwagon and introduced many new products in test markets in 1987. Kraft has test-marketed the "Makin'Cajun" line of sauces such as Creole, Spiced Brown, Barbeque and Spaghetti sauces. McCormick and Co. has introduced "Brennan's of New Orleans," a line which can be used for dessert toppings, hot sauces and seasonings.

The low calorie/reduced calorie dressing market saw the largest increase in sales in the dressing and sauce segment. SAMI/Burke reports the sales of these items to be $170 million in 1987 as compared to $146 million in 1986, a 13% increase. On the other hand, spoonable dressings experienced a loss of 1.9%.

STATE OF THE FOOD INDUSTRY

NON—ALCOHOLIC BEVERAGES

The value of bottled and canned soft drinks industry shipments rose 6.2 percent in 1987 to $21.8 billion. Since 1980, per capita consumption of soft drinks has been rising about 3.4 percent yearly and was forecasted to reach 47.6 gallons in 1987, according to the Department of Commerce (DOC).

Over the past two years, many local and regional bottling companies were sold. Changes in income tax treatment of capital gains resulted in about 100 bottling companies, mainly of Pepsi and Coca-Cola, selling their businesses to other bottlers.

According to the industry observers, DOC says, the combined owned and operated local bottling operation of Coca-Cola and Pepsi accounts for $6 billion (wholesale) of soft drinks annually or 30 percent of soft drink bottler shipments.

Seven-Up tried to boost sales in 1987 by introducing its new product, *Cherry Seven-Up*. The product was a success, and the company reported a 25 percent increase in sales, solely because of this new product introduction.

Coke and Pepsi fought out the rights to have their products on tap at Burger King. After a lot of media hoopla, Pepsi's contract was renewed. At the present time, Coke has about 60 percent of fountain sales, according to DOC, and Pepsi has about 25 percent. Fountain sales are important to the soft drink companies because of brand loyalty and the increase in the market as more people eat meals away from home.

Pepsi introduced *Jake's Cola*, hoping to get a larger market share in the soft drink segment, and banking on the appeal to a less strict calorie counter. This reduced calorie drink contained 30 calories, but the product never caught on.

The overall outlook is good for the soft drink industry with a projected 4.2 growth for 1988. The National Softdrink Association claims that each American consumed approximately 43 gallons in 1986.

Since many people are deciding not to drink tap water, because of taste, or a false notion of contaminated tap water which is really safe, the bottled water market could double in the next decade. Consumption of bottled water grew 26 percent in 1987, according to SAMI, Inc. New York, NY. A survey taken in 1984, showed that a quarter of California homes used bottled water. While the consumption of bottled water is mainly East or West Coast, studies also show that the college-educated, 25-54 age group is also most likely to purchase bottled water.

While most of the players in bottled water are small, local companies, more large companies are entering the fray. McKesson has about 11 percent of the market, and Anheuser Busch is getting more involved, especially with flavored seltzers. Perrier, the number one imported bottled water company, acquired Arrowhead Drinking Water Company, one of the largest brands, from Beatrice last year.

Total sales of fruit and vegetable juice and drinks exceeded $8.5 billion in 1987, an increase of 8.5 percent over the previous year. Fruit drink sales increased 14 percent annually since 1980 and now have a 39 percent market share. Tomato and vegetables juice now only have 3.1 percent of the market. Unit sales of chilled orange juice outperformed all other segments of the orange juice market during 1987 and was up 15 percent. Frozen orange juice was up 6 percent, while canned orange juice was down one percent, according to DOC.

Sales of non-alcoholic beverages

	1987	change from 1986
Juices		
Tomato and Fruit	$1.885 billion	+3.4%
Concentrate	$1.607 billion	+12.4%
Soft drinks	$32.908 billion*	+4.5%*
Powdered drinks	$72 million	-10.3%
Bottled water	$367 million	+26.2%
Non-alcoholic beer	$7.8 million	not available
Iced tea mixes	$320 million	-8.6%

*estimated

Source: SAMI, New York, NY; Beverage World, New York, NY; National Soft Drink Association, Washington, DC.

In addition to excellent sales in soft drinks, Coca-Cola introduced a 100 percent fruit juice line extension to its popular Hi-C line. The product is designed to appeal to children's taste, but satisfy parents requirements for nutrition.

Coke was also the first company to introduce an aspartame sweetened fruit drink in the U.S. The Minute Maid line of *Light n' Juicy* was introduced early in 1987.

Also introduced by Coca-Cola Foods in 1987 was *Minute Maid Squeeze Fresh*, a frozen juice concentrate in a squeeze bottle. Positioned as a convenient alternative for chilled juice, the product was aimed at the single serving market which is becoming increasingly important in all segments of the food industry as lifestyles are changing (especially more working women). Test-marketed last summer and fall, the makers claim it will stay fresh in the refrigerator up to five weeks.

Juicy Juice, from Nestle, leads the pack of juice blends, while Kool Aid continues to dominate the powered drink mix market, greatly outdistancing Wyler's and Crystal Light.

Flavored and sweetened seltzers or sparkling waters are growing in popularity, with sales in some sectors up 50 percent (see *FE*, April 1988, p.160). Although the market is greatly expanding, at the present time this segment of the soft drink industry is very small. This category is aimed at older drinkers who want a more healthy drink that contains less sugar, but is still fun to drink.

STATE OF THE FOOD INDUSTRY

FROZEN FOODS

Shipments in the frozen food industry rose 7.8 percent (3.5 percent adjusted for price change) in 1987, according to the U.S. Department of Commerce (DOC). Frozen specialty products were up 4.3 percent, and frozen fruit and vegetable production rose about 2.5 percent.

Low calorie, quality frozen entrees and dinners continue to be popular with consumers, but growth in sales in this segment of the industry is increasing at a slower rate than in previous years.

DOC predicts a 2.5 percent growth in frozen food shipments for next year caused by continued demand for low calorie, high nutrition frozen entrees.

The demand for these convenient and nutritious foods is due to several factors that are changing how and what Americans eat. As in many other segments of the food industry, more and more women and working mothers are entering the workplace, two family incomes and single parent households are on the rise, and people are having fewer children. Microwave ovens have invaded 60 percent of American homes and 50 percent of workplaces. The convenience of frozen foods cooked in the microwave is invaluable to these busy people. This coupled with changing lifestyles has made its mark on frozen foods, especially entrees and dinners.

The market for prepared frozen foods has prospered over the past several years, according to Find/SVP, New York, NY. Changing lifestyles and demographics, specialized products lines and widespread use of microwave ovens have all contributed to the market's growth, although the overall growth of frozen foods markets is now beginning to decelerate, Find/SVP says.

Frozen dishes have retained their popularity, in part because traditional single earner families are on the decline in the U.S. But while statistics show that consumers have indeed been purchasing more frozen foods, many have been the new upscale or premium products such as low calorie dinners and entrees, breakfast food and frozen soups. Since these products cost more than the standard TV dinners, frozen pizza, and pot pies, they tend to give a false impression of real growth for frozen food, according to Find/SVP. Some of the upscale or gourmet frozen food lines introduced this past year include: *Green Giant Microwave Garden Gourmet* from Pillsbury featuring premium vegetables and pasta or rice in a variety of sauces; and Stouffer's addition of four new items to its line of *Dinner Supreme*–Chicken Parmigiana, Veal Parmigiana, Turkey Divan and Chicken Monterey.

According to an American Frozen Food Institute report, the increased use of frozen foods and the growth of microwave ovens are trends that have been feeding on each other. Preparing frozen entrees ranked in the top five uses (out of sixteen) for microwave uses, according to a survey by Consumer's Union. And while half of U.S. workers have access to a microwave oven, two-thirds of those who have access use them to prepare lunch.

But are consumers happy with the frozen entrees? Not exactly. Consumers like the convenience of frozen entrees, but are not thrilled by the taste, healthfulness and quality of prepared frozen foods, according to a poll by the Consumer Network.

And frozen foods are beginning to feel the pinch of the ever popular fast food restaurants, as well as in-store delis, bakeries, fish counters and salad bars.

With the rise in single households and the trend towards families on the go, single serve frozen items may be on the rise. Also, some families are not eating as many meals together.

One new item in the single serve category is *Zappetites*, a product made specifically for the microwave oven. This line from Oscar Mayer includes Chicken Nuggets, Italian Pizza Bread and Mexican Style Stuffed sandwich.

The frozen pizza industry, with many lines including single serve or "pizza for two," is worth $1 billion alone. Competition is tough and Pillsbury dominates the category with its assortment of lines and brands. And with most frozen pizzas microwaveable, this category is expected to grow. In 1987, Pillsbury introduced Totino's pan pizza and Totino's microwave pizza, each featuring a variety of toppings.

Product shipment of specialty frozen foods, adjusted for price changes, will grow about 5 percent in 1987, compared to an annual growth rate of 10 percent from 1982 to 1986.

As shown in the accompanying chart, sales of Mexican dishes were up 25 percent over 1986, according to SAMI, New York, NY. Sales of vegetables with cheese sauce were also popular and were up 20 percent. Oriental dinners took a dive in 1987 with sales dropping 32 percent.

Sales of selected frozen foods
(In millions of dollars)

	1987	change from 1986
Meat	$154	-3.9%
Fish	$1,000	+13.5%
Mexican dishes	$263	+25.2%
Mexican dinners	$97	+8.4%
Oriental dishes	$223	-17.1%
Oriental dinners	$47	-32.0%
Vegetables with butter sauces	$76	+3.7%
Vegetables with cheese sauce	$94	+20.5%
Vegetables without cheese sauce	$95	0
International vegetables	$126	+7.5%

Source: SAMI, New York, NY.

STATE OF THE FOOD INDUSTRY

SEAFOOD

U.S. per capita seafood consumption (lbs.)

	1982	1983	1984	1985	1986	1987
Fresh/frozen	7.7	8.0	8.5	9.0	9.0	10.0
Canned	4.3	4.8	4.9	5.1	5.4	5.1
Cured	.3	.3	.3	.3	.3	.3
Total	12.3	13.1	13.7	14.5	14.7	15.4

Source: National Marine Fisheries Services

The U.S. seafood industry set a goal of 15 pounds per capita seafood consumption for 1987. And despite some skeptics predicting it was too ambitious of a goal, per capita seafood consumption in the U.S. reached 15.4 pounds in 1987. But as demand for seafood climbed so did prices which had a detrimental effect on consumption.

"Towards the end of the year, the inevitable happened in many areas," explained Robert P. Brubaker, president of the National Fisheries Institute (NFI), at the annual NFI convention held last April in New York City. "Consumers began to resist the high price tags; movement in certain areas slowed as major foodservice and retail chains reduced or eliminated promotions."

Brubaker went on to point out that inventories have swelled causing a lowering in prices to the trade. The challenge ahead for the seafood industry is to rekindle consumer demand, and more importantly, the desire of the trade so that growth can continue.

Seafood offers potential for increased profits due to the large potential for value added items. In 1987, commercial fishermen and fish farmers harvested products which sold for $3.57 billion, according to Brubaker. Of that amount, about $450 million worth was transferred at sea to foreign processing vessels in joint venture operations and another $897 million worth was sent overseas as exports without any further processing. This left $2.22 billion worth which moved into the domestic market.

The $2.22 billion domestically caught seafood, combined with $1.92 billion of imported raw items such as shell-on shrimp, raw tuna and fish blocks, goes to wholesaling or further processing, Brubaker continued. At this point $4.18 billion in value is added to the seafood. About $763 million dollars of this production is exported, leaving $7.56 billion worth for sale in this country. In addition about $3.86 billion of completely processed seafood is imported.

The wholesale distribution stage again adds value, totaling $2.6 billion and these products are sold to the retail trade (supermarkets, seafood shops and the foodservice industry) for more than $14 billion, says Brubaker. Supermarket and foodservice establishments also added value.

"The end result is that U.S. consumers pay almost $29 billion for fish and seafood products—this figure represents a 17 percent increase from 1986 and a 27 percent increase from 1985," said Brubaker. "When one adds the value of export and joint venture sales, the total dollars generated by fishery products exceeds $30 billion."

Another way of looking at seafood consumption is to examine how frequently it was consumed. "Last year, American consumers on average ate fish or shellfish slightly more than once a week," points out Lee J. Weddig, executive vice president of NFI. "They ate fish on about 12-13 billion occasions...included were 5-6 billion tuna sandwiches and salads and about 1.5 billion fish sandwiches."

Two important areas of the seafood industry—especially in terms of expanding consumption—are surimi-based products and aquaculture. The future growth of the surimi industry will be partially dependent on labeling requirements. Currently, if a surimi-based product is nutritionally inferior to the product it resembles and is replacing, it must carry imitation labeling which has a negative connotation with consumers. The National Food Processors Association (NFPA) released a report last March on the nutritional equivalency of surimi. It concluded that surimi-based seafood analogs generally provide less nutrients than shellfish.

One alternative to the use of imitation labeling is to fortify the analogs (increasing the protein levels to that of shellfish may impact the textural properties, though); another would be the approval of a regulation allowing a common or usual name for these products which the FDA would consider if a lack of feasibility to fortify could be shown. Currently, the NFI surimi committee is drafting a petition requesting the use of "surimi seafood" as a common or usual name for surimi-based seafood analogs.

Limited supplies of popular species of seafood has lead to the increasing importance of aquaculture. In 1987, 14 percent of U.S. seafood consumption was from aquaculture products. The U.S. has both catfish and trout aquaculture industries firmly in place, with ongoing efforts to develop and/or expand a number of others such as salmon, shrimp, and mussel aquaculture ventures. A major effort is underway (with funding from the government) to develop large-scale shrimp farms in the U.S. since our 1987 deficit in shrimp was $1.2 billion—second only to oil.

While availability of seafood is critical to a increasing consumption, the most significant issue facing the seafood industry is thought by many to be quality control. Pressure has been mounting to include seafood in government inspection programs. Although, a recent study of FDA activity in this area showed annual activity in the range of 870 to 1400 plant visits, 6000 sample collections, and 5000 warf exams. And, many major companies employ the National Marine Fisheries Service on a voluntary basis for more comprehensive inspection service. Despite a "belief that fish products are generally wholesome and safe," the industry does not advocate status quo, though. The NFI is working on a recommendation for improving government inspection of seafood and hopes to present it to Congress by early 1990.

Circle 53 or see FEM, p. 108 →

7/26/88 C2150-6

CHILTON'S

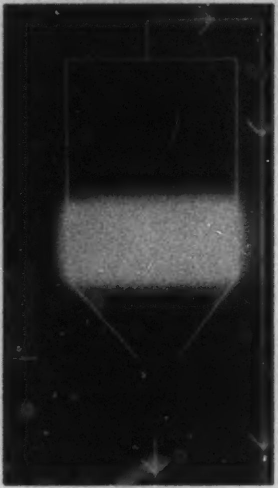
JULY 1988

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

BATCH CONTROL

FOOD ENGINEERING



COVER STORY

Process control takes a lot of the guesswork out of the manufacturing process, and in the end, makes the manufacturing scenario reliable.

Pages 53 to 64

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) July 1988, Vol. 60, No. 7. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ™Chilton Company, 1988. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

13 Industry Report
This month's Report talks about how fat has replaced salt as consumers' top nutrition concern according to FMI; the arrival of the European-style hypermarkets in the U.S.; and NutraSweet's announcement that the Food and Drug Administration approved the use of aspartame in six new categories.

25 Marketplace
The popularity of fruit has led to a flood of beverages and frozen desserts made with it.

Departments

7 Editorial
10 Calendar
13 Industry Report
25 Marketplace
29 Packaging
96 New In Print
106 People

HIGH FIVE
HIGH FIVE
HIGH FIVE
HIGH FIVE

FRUIT FLAVORED DRINKS: PAGE 25

Engineered Foods

34 Seafood
Despite record growth of seafood consumption in the U.S., problems await if critical issues are not addressed.

39 Potato Ice Cream
Low-fat sugar-free ice cream is sweetened with fruit and contains 20-50 percent less calories than premium ice cream.

40 Butter Flavors
With estimates that up to 70 percent of all homes have microwave ovens, it's obvious that the consumer wants convenience. Dairy flavor development is one area of importance.

42 Unmodified Starch
Unmodified starches continue to account for slightly more than half the starch used in the U.S.

46 Choices
49 Literature

BUTTER FLAVOR: PAGE 40

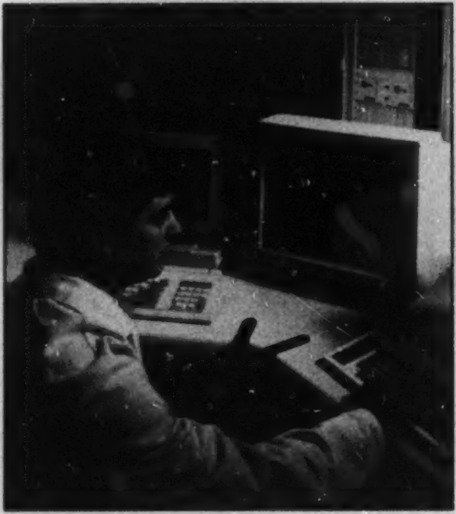
CHILTON
FOOD
GROUP

Features

53 Process Control Update
Process control systems encompass a large area. The systems can control discrete, continuous and batch processes very efficiently. But it is the area of batch control that holds the most intrigue for food industry equipment suppliers and processors alike.

67 Talking with Ted Labuza
Part two of our interview with IFT's president Ted Labuza discusses biotech developments, biotechnology for process monitoring, and new technologies in general.

73 CAP and VAC Packaging
Slow at first to shift mindset from commodities to "value-added," the red-meat industry is making up for lost time in its drive toward greater efficiency. Creative plastics pave the way.



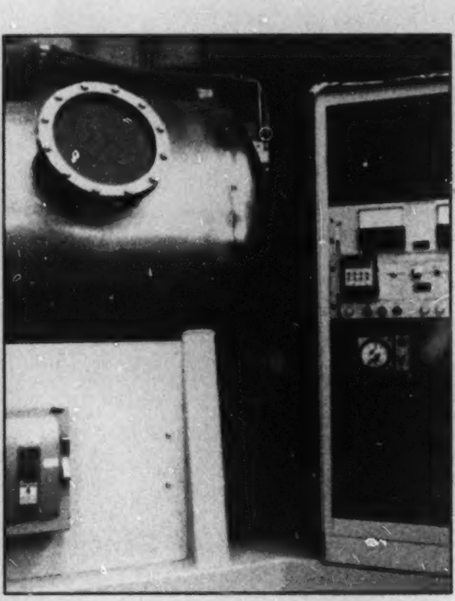
PROCESS CONTROL: PAGE 53

From the Field

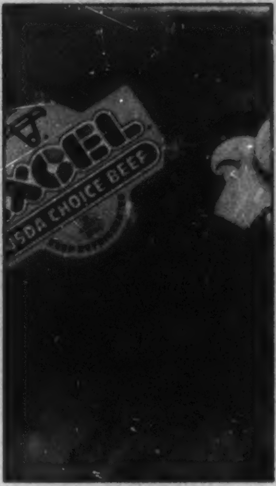
81 Drying technology makes dried fruits taste like fresh
88 Cookies don't crumble with controlled seals
90 Cold-storage facility offers 2.5 million cubic feet of space
92 Process control retrofit costs only 16 hours downtime

New Equipment

98 Processing Equipment
101 Packaging Equipment
104 Instruments/QC



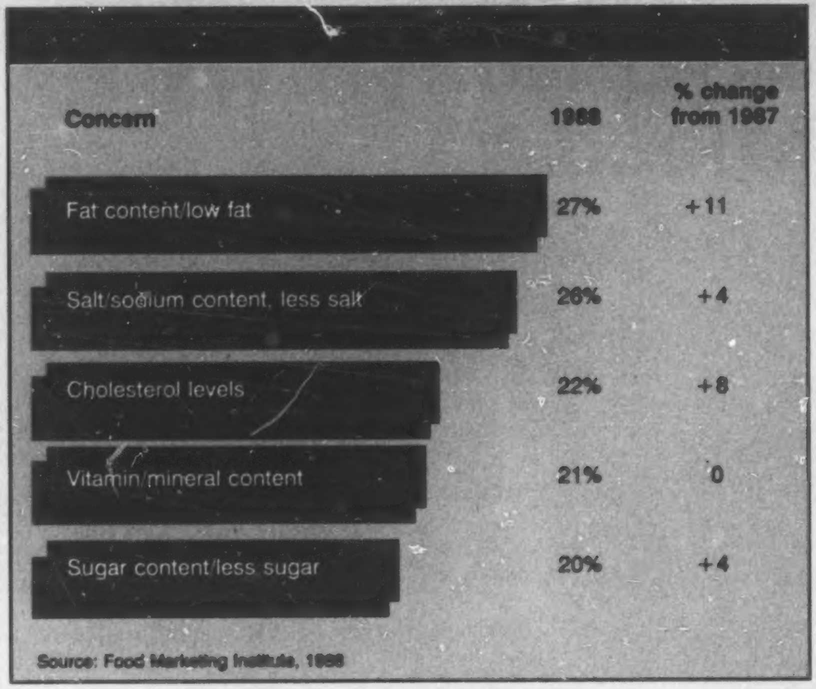
FRESH FRUIT DRYER: PAGE 81



Special Emphasis

CONTROLLED ATMOSPHERE AND VACUUM PACKAGING
The twin technologies of vacuum-packaging and controlled atmosphere packaging (CAP) are accelerating the trend toward centralized retail meat cutting.
Pages 73 to 79

Fat replaces salt as consumers' top nutrition concern, says FMI



Source: Food Marketing Institute, 1988

Fat has replaced salt as the major nutrition concern of consumers, according to the 1988 "State Of The Industry" report presented May 9 at the annual Food Marketing Institute convention in Chicago.

The finding marks a dramatic reversal in consumer attitude over the past five years, noted Dean Werries, president and CEO of the Fleming Companies, Inc. In 1983, 18 percent of consumers surveyed cited salt as their major concern as compared to only nine percent who listed fat as their major concern. "This year, however, the concerns were reversed–fat 27 percent, salt 26 percent," Werries reported. "Close behind were cholesterol (22 percent) and vitamin/mineral content (21 percent)." Concern about fat and cholesterol grew at a gradual pace over the past five years "but the largest changes occurred in the past year," Werries continued. "Concern over fat content increased 11 percent, and for cholesterol eight percent."

Because nutrition concerns increase with age, said FMI Senior Vice President Tim Hammonds, the importance of health and nutrition in food marketing will grow with our aging population. By the year 2000, Hammonds pointed out, nearly 40 percent of the U.S. population will be over age 40. "By the turn of the century, we're going to raise the mid-life crisis into a national art form," he added.

More shoppers are checking labels for caloric content (48 percent this year versus 47 percent last year) and for fat content (46 percent versus 44 percent in '87), Hammonds reported. More than half (54 percent) check labels for salt or sodium content.

Consumers are also moving toward an attitude of "moderation, not elimination," Hammonds continued, leading to a "watershed change" in agricultural production. Farmers no longer simply bring products to market with the hope consumers will buy them; today, "biotechnology lets farmers track consumer preferences and actually redesign their animals and products to fit the marketplace," said Hammonds. "We are on the eve of producing traditional plants and animals with vastly superior nutrition characteristics." The meat industry, "has made great strides in breeding leaner animals, with pork producers leading the way," added Werries.

Further highlights from the FMI report:

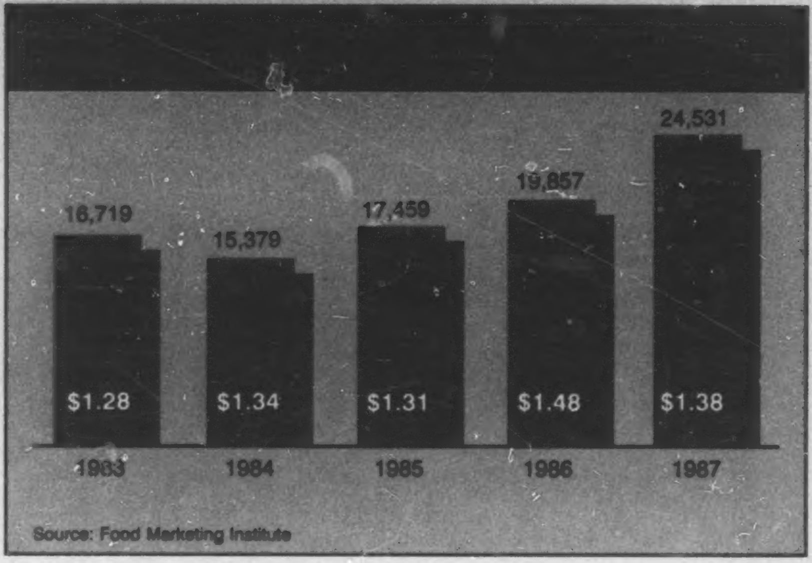
- Mergers and acquisitions continued at a brisk pace despite forecasts they would cool under new federal tax laws and state anti-takeover legislation. In 1987 there were 31 supermarket mergers/acquisitions and 33 grocery wholesaler takeovers–the latter "more significant when you consider that their numbers were already much smaller." As hostile takeover threats force large public companies to focus on short-term profits rather than investing for the future, foreign investors are taking the opposite view: They're looking for long-term growth opportunities in the U.S. which they can't find at home.
- Produce for the second consecutive year topped the list of factors most important to consumers (98 percent) in selecting a supermarket, proving that last year's finding "was no fluke." The accent on produce reflects several trends: Health/nutrition, fresh foods, greater variety. Other factors: Variety (96 percent); quality meat (94 percent); low prices (94 percent); convenient location (92 percent); readable and accurate shelf tags (92 percent).
- New products and services: Consumers most frequently noted the availability of microwaveable foods (93 percent), followed by availability of fresh deli or carry-out foods (80 percent).
- Food safety: Eighty-nine percent of shoppers check package condition, 79 percent check expiration dates and 76 percent prefer tamper-evident packaging when they have a choice.
- Labor shortages face the supermarket industry at a time when shoppers are demanding more service. Some operators are already recruiting from less traditional sources such as

Grocery	49.1%
Produce	5.8%
Refrig./Frozen	23.2%
GM/HBA	12.7%
Others	9.2%

Source: Food Marketing Institute, 1988

senior citizens and the handicapped, some are busing employees to work from inner-city areas.

- New product buying criteria: Eighty-eight percent of supermarket buyers use inventory turns, 59 percent use product mix, 52 percent use customer feedback, 40 percent use scanning data and a surprisingly low 12 percent use DPP (direct product profit) in making buying decisions.
- JIT: In spite of those who believe that the threat of being out-of-stock means just-in-time deliveries cannot work in supermarkets, "other industries are making it work and European (supermarket) operators are making it work," said Hammonds. "Someone is going to figure out how to make the supermarket version of just-in-time delivery work."
- Deals and allowances: The recent Walter Salmon study of trade promotion practices, while greeted cooly at the FMI Midwinter Executive Conference, brought the issue "out of the closet" and "opened the door to creativity where only accusations and distrust existed before," said Hammonds. One clear point made by the study, Werries added: "In an industry this diverse, there are no universal solutions to the issue of deals and allowances." Practices such as "slotting allowances," "street money," "diverting," "forward buying," "classes of trade" and others "have not come about be-



Source: Food Marketing Institute

Hostile Duty
US MOTORS
USMOTORS
Ask for U.S. Motors—the technology leaders.

KRONES
GARANTOMAT.

INTEGRATE
LABELING
AND TAMPER
PROOFING
ON ONE
MACHINE -
WITH ONE
OPERATOR!

KRONES

Krones, Inc. 9600 S. 58th Street
Franklin, WI 53132-0100 (414) 421-5650

Circle 13 or see FEM, p. 421

cause our industry leaders have suddenly become men of ill will," said Werries. "Each in its own way is a symptom of a changing industry. We are literally redefining the grocery business in response to a changing consumer, changing technology and a changing global economy."

Hypermarkets: Emerging revolution?

"The most newsworthy retail development this year is the arrival of the European-style hypermarket in America," said Tim Hammonds, senior VP of Food Marketing Institute, in presenting FMI's annual "State Of The Industry" report May 9 in Chicago.

These megamarkets—"malls without walls"—combine supermarkets with discount department stores and cover 150,000 to 300,000 sq. ft. (some "the space of five football fields"). But "for some shoppers that's a little overwhelming," said Hammonds. "Although the jury is still out on whether stores will be successful in the U.S., one thing is clear: They will certainly teach all of us a lot about how to merchandise non-foods in a grocery setting. For anyone facing these behemoths, niche marketing becomes more important than ever."

Veteran observers of the supermarket industry note that there's really nothing new about the concept: Some U.S. supermarket chains started operating large combination grocery/general-merchandise discount stores at least 25 years ago, and the "general store" goes back to colonial times. What's new about the hypermarket, however, is its sheer size and degree of automation.

According to the FMI report, supermarkets have grown in size over the past decade as the number of stores declined slightly. Today's average U.S. supermarket covers 46,892 sq. ft., with 33,000 sq. ft. of selling area. As U.S. population growth rate declines, "the industry is casting bigger nets to catch a slower-growing population," said Hammonds. "Today, stores are going after new retail opportunities." One example: Kroger Co. is now the nation's largest retail florist.

Willard R. Bishop, Jr., president of Willard Bishop Consulting, Ltd. (Barrington, IL), reported results of a consumer reaction survey to two new hypermarkets: Hypermarket USA, a joint venture started-up by Tom Thumb and Wal-Mart last December in the Dallas suburb of Garland, TX; and Carrefour, opened last February by the French firm in northeast Philadelphia. The study is based on telephone interviews of 500 random households within a close radius of each store. Major conclusions, said Bishop:

- Consumers are "very enthusiastic" about the hypermarket concept based on two factors: Low prices and one-stop shopping, although Hypermarket USA has a stronger image as a low-price operator.
- Perishable departments project a strong "freshness" image spanning produce, bakery, seafood, deli and

ocessing fo

Kathabar Dehumidification systems — provide humidity and temperature control regardless of outside air conditions. Make money through continuous reliable operation -- increased production, more uniform quality product. In packaging cereals, candy, dairy products. In sugar coatings. In panning and packaging confections. In breweries. For product cooling. For coffee drying. In dry sausage processing. Many other humidity sensitive operations. For our free brochure, write to:

Kathabar Systems
Somerset Technologies,Inc.
P.O. Box 791
New Brunswick, N.J. 08903

KATHABAR

Circle 15 on Inquiry Card

KRONES
GARANTOMAT.

FAST, EASY CHANGEOVER USING DOUBLE REEL FEED AND REMOVABLE BANDING HEADS!

KRONES

Krones, Inc. 9600 S. 58th Street
Franklin, WI 53132-0100 (414) 421-5650

CHILTON'S

AU 8

C2158-6
9/2/88

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

HACCP

PRE-EMPTIVE QUALITY CONTROL

FOOD ENGINEERING

COVER STORY

HACCP (Hazard Analysis/Critical Control Points) or preemptive quality control—a system that checks the process for contamination—is undergoing a renaissance.

Pages 70 to 80

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + .25¢)

FOOD ENGINEERING® (ISSN 0193-323X) August 1988, Vol. 60, No. 8. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ©Chilton Company, 1988. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

13 Industry Report

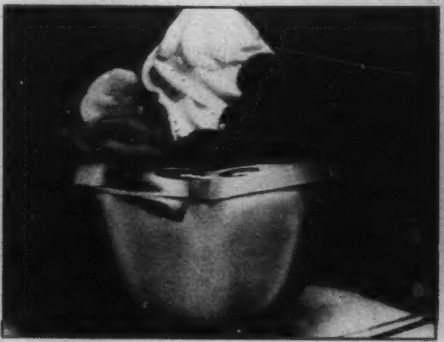
This month's Report talks about the NAS report on consumers' cut in consumption of fats in meat and milk, but increase of fat in processed food; the food industry's high GNP ranking among all U.S. industries; the food claims credo according to IFT's President-elect Hopper; and options by which the FDA may resolve regulatory issues concerning carcinogens.

35 Marketplace

This month's report focuses on convenience for food service, the theme of this year's National Restaurant Association Show; and the popularity of fruit soups and vegetable drinks as Japanese "health" foods.

Departments

9 Editorial
10 Calendar
13 Industry Report
35 Marketplace
143 New In Print
168 People



LOW CALORIE DESSERT: PAGE 35

Food Packaging

44 Tamper Resistance

Microencapsulated colors, special adhesives, magnetic codes and creative laminations can be used to foil the tamperer.

48 Barrier Pack '88

New multilayer barrier plastic structures extend the shelf life of retorted, hot-filled, vacuum-packaged and CAP-packaged foods.

50 Degradable Plastic

Polyethylene incorporating corn starch breaks-down through oxidation and microbial digestion.

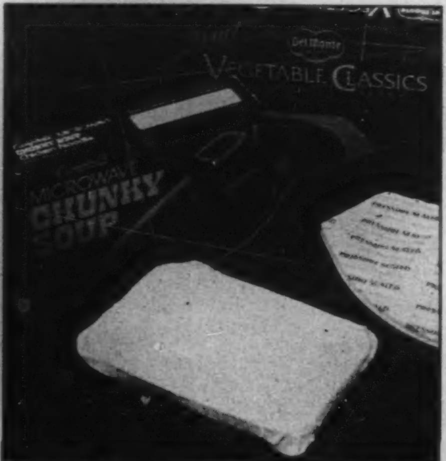
54 Gemella Trays

French technology combines rigidity and graphics of paperboard with barrier plastic sheet for CAP.

55 Steel Cans

The way the steel people see it, steel cans deliver the lowest-cost, most practical packaging alternative.

59 Trendwatch
60 Literature



EVOH BARRIERS: PAGE 48

Features

70 HACCP

HACCP first came to light in the sixties, in support of the U.S. effort to send men into space. But it remains as contemporary as the latest food safety concern, and is a procedure every processor should be familiar with.

83 IFT Post-show Report

The demand for good tasting, convenience foods remains strong. And attendees at this year's Institute of Food Technologist's Food Expo found numerous ideas for developing products to meet this demand.

104 Solving Problems on Micros

Most electronic spreadsheet programs are used for business and financial calculations. However, an in-depth look into their capabilities shows they are just as well-suited to engineering calculations.

113 Flavor Research

Flavor research in the U.S. is revolving around: higher quality and custom-designed flavors; more stable seasonings; and flavors that will withstand the high temperatures of microwave cooking and extrusion.

NATURAL COLORS: PAGE 83

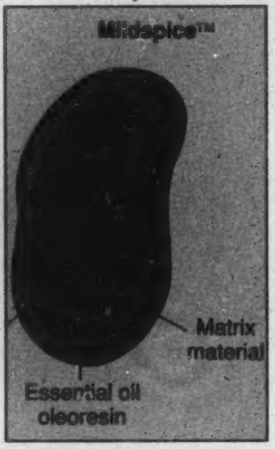
From the Field

120 Mixer eliminates problems of cooking Mexican foods
126 Equipment maximized with preventative maintenance
130 Programmable controllers guarantee 'McPerfect' buns
136 Metal detectors ensure quality product for meat processor
138 Adsorbent filter aid results in savings for potato processor
140 Pump increases productivity and cuts winery costs

New Equipment

148 Processing Equipment
159 Sanitation & Maintenance
163 Handling & Distribution

ADSORBENT FILTER AID: PAGE 138



Special Emphasis

FLAVOR RESEARCH

The line between seasonings and flavors is becoming blurred as traditional flavor companies introduce seasoning replacements and spice companies offer spice blends with increased flavor.

Pages 113 to 118

Food industry ranks high in GNP, jobs, and value of shipments

Depending on how you measure it, the U.S. food industry ranks first, second or third among U.S. industries, reported Dr. John M. Connor, agricultural economist from Purdue University, at the annual meeting of the Institute of Food Technologists June 20 in New Orleans. Connor presented data from his report, *Food Processing: An Industrial Powerhouse In Transition*, commissioned by the IFT Research Committee and published in July.

In terms of value added as a contribution to Gross National Product (GNP), the food-processing industry ranked No. 3 among the top 20 U.S. manufacturing groups in 1985, Connor reported. By this measure, food processing added value of $104 billion, or 10.4 percent of the value added by the entire manufacturing sector.

When food processing is examined as a vertical system stretching from farm to supermarket, however, the food system comprises the nation's largest single economic activity, contributing $339.2 billion worth of value added (excluding tobacco) to the GNP in 1982. Connor broke out the value added by each stage in the food system:

- Agriculture: $69.5 billion (20.5 percent);
- Processing: $80.4 billion (23.7 percent);
- Wholesale/retail: $125.5 billion (37 percent);
- Food service: $41.7 billion (12.3 percent);
- Transportation: $22.4 billion (6.6 percent).

More broadly defined to include suppliers of equipment, ingredients, materials and services, the food system contributed about $487 billion to the GNP in 1982, said Connor—"almost 16 percent of total U.S. economic activity and 2½ times the GNP devoted to defense."

Job creator

By employment measurements, food processing:

- Ranks third in direct employment (1.7 million) after electrical and nonelectrical machinery.
- Ranks second in value of shipments per employee ($200,000).
- Has an employment multiplier (i.e., additional jobs created per industry job) of 3.74—far above the U.S. industry average of 2.18. "The greater an industry's economic linkages, the greater the multiplier," Connor pointed out.
- Accounts for 4.8 million jobs when indirect employment (agriculture, equipment, transportation, etc.) is included.
- Accounts for 14 million jobs—"more than there were in 1950 despite the decline in agriculture"—when wholesaling, retailing and food service are included.
- Accounts for 18 million jobs, or 17 percent of the civilian work force, when related sectors such as fertilizers and feed are factored in.

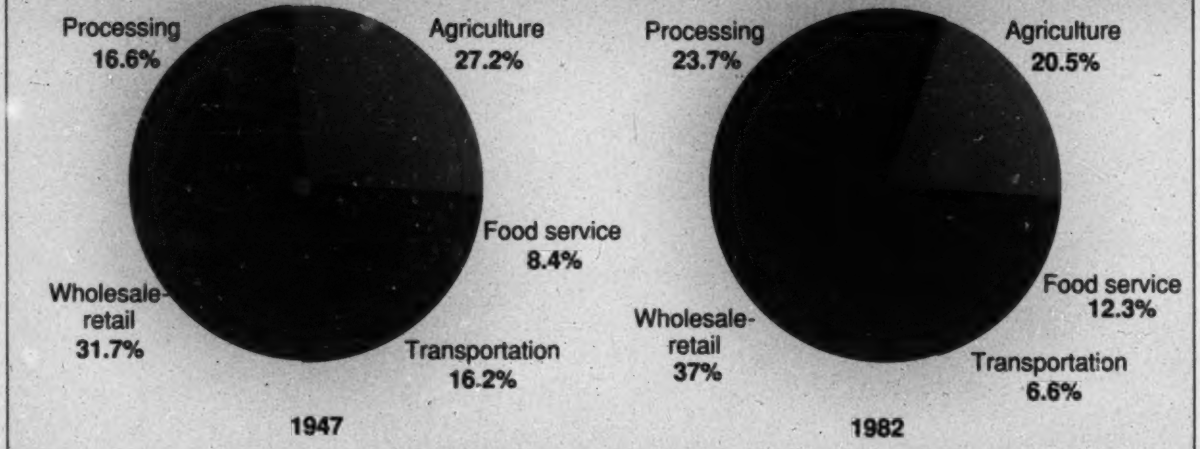
These figures do not include an estimated 150,000 scientists, engineers and regulatory people employed in R&D by industry, universities and government.

Fewer firms, fewer plants

Based on the value of shipments, food processing is the largest manufacturing industry in the U.S. Shipments in 1985 totaled $302 billion, or 13 percent of all manufacturing-industry shipments and $85 billion higher than the next largest industry group (nonelectrical machinery).

The number of U.S. food plants fell from 37,000 in 1963 to 22,000 in 1982 and nearly half of these had 20 employees or less, Connor continued.

(Continued on page 23)



Sources: John M. Conner; IFT Research Committee

While the number of food processing plants has declined, food processing today is the largest manufacturing industry in the United States. Shipments in 1985 totaled $302 billion, or 13 percent of all manufacturing-industry shipments throughout the nation.

GNP

(Continued from page 13)

About 100 new plants are built each year as nearly 1,000 shut down. Plants with 100 or more employees account for 73 percent of food-shipment value and 72 percent of total employment. "It is likely that by the year 2000, only 13,000 to 14,000 food-processing plants will remain in operation, with the average size much larger," Connor predicted. (Editor's note: *Food Engineering's 1987-88 Directory of U.S. Food & Beverage Plants* lists 13,500 plants employing 20 or more people.)

Industry consolidation is a significant change, Connor continued. The number of food-processing firms has declined by about 4 percent per year since 1963 to a historic low of less than 14,000 in the late '80s. In 1963, the 50 largest food processors owned 42 percent of all food-processing assets; by 1987 that figure "had climbed to an enormous 75 percent share and will reach 90 percent by the year 2000," said Connor. Although high profitability seems to be a major motive for food-industry mergers and acquisitions, "recent research shows that most mergers turn out to be relatively poor investments because of the high acquisition prices paid and subsequent mismanagement by the acquiring firms," said Connor (*FE* June, '87).

Foreign investment in the U.S. food-processing industry surpassed that of U.S. investment in the food industry abroad in 1984 and "foreign-owned companies now control about 10 percent of sales in the U.S. market," Connor continued. On the other hand, sales by foreign affiliates of U.S. food processors equaled 37 percent of domestic sales and 27 percent of all world sales. Overall, 31 percent of U.S. food processor sales occurred abroad in the early '80s, up from 29 percent in 1977.

Food processors spent $834 million on R&D in 1984, Connor reported, up from $259 million in 1972 and $130 million in 1963 for a growth rate averaging 9.3 percent per year as compared to 8.6 percent for all U.S. industry. Yet food processing R&D expenditures represent only 0.4 percent of sales—the lowest ratio of any manufacturing-industry group—and are concentrated in just a few firms: In 1982, about 70 percent was expended in 20 programs. The U.S. supply of scientists and engineers has risen about 7 percent per year over the past decade and about 150,000 of these are employed in food-related jobs but this number declines every year. "The stark fact is that other sectors have lured these trained personnel to work on other matters," said Connor. Result: Greater borrowing of technology from other industries and from abroad.

Less than 10 percent of R&D results in new products, with the remainder devoted to new materials, applications, machinery and processes, Connor reported. This shows-up as improved productivity: Labor productivity in food processing has grown at a rate of about 3 percent per year since 1963, slightly higher than for all manufacturing. But this has required big increases in capital investment.

Circle 14 on Inquiry Card

味

aji (ah'·jee) *n.* **1.** taste. **2.** flavor. [from the Japanese]. Usage: *Aji, as in Ajinomoto, means taste.*

Sample the just-right seasonings: Ajinomoto Nucleotides.

We'd like to send you a few free samples of Ajinomoto Nucleotides. Because we think you should taste what you've been missing.

Just the right taste. By combining Ajinomoto nucleotides with Ajinomoto MSG in your fine foods, you get the maximum in flavor enhancement. No wonder ours is the best-selling nucleotide line in America.

Just the right amount. Ajinomoto can now supply pure quantities of IMP (disodium 5'—inosinate) and GMP (disodium 5'—guanylate), as well as Ajinomoto I&G, a flavorful mixture of the two. These three nucleotide products allow real flexibility in all your food preparations. Use alone or in combination. Enhance every food, every recipe.

Just the support you'd expect from America's leader. The backup you'll get from Ajinomoto is unparalleled in the industry. Our nationwide service network is as impressive as our nucleotide products themselves.

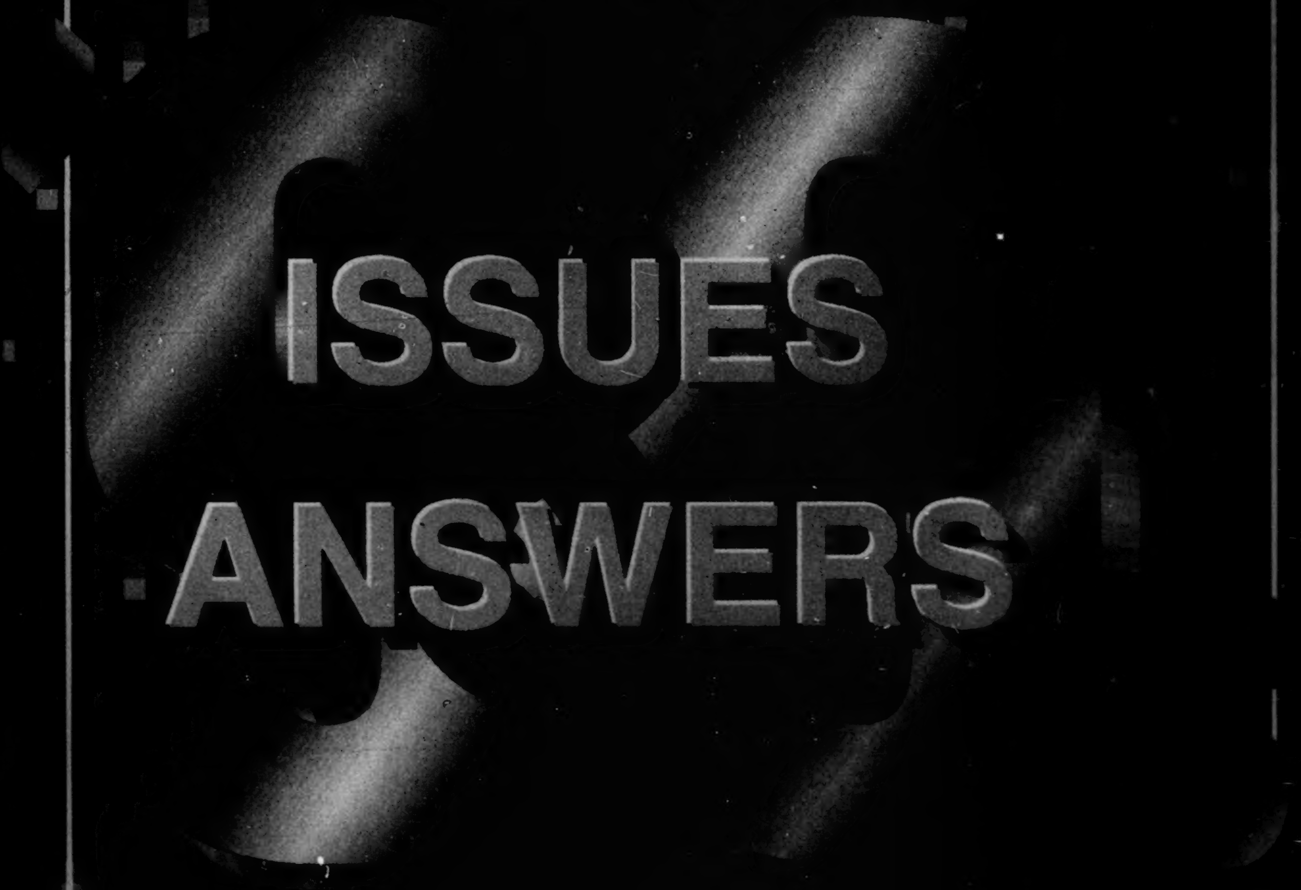
So circle the appropriate reader-response number on the enclosed reply card. Or to get your free sample pack a bit faster, just call directly.

AJINOMOTO U.S.A., INC.
500 Frank W. Burr Blvd., Teaneck, NJ 07666-6894
(201) 488-1212

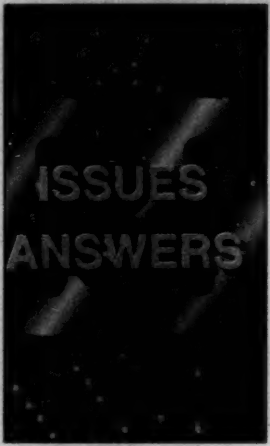
Circle 15 or see FEM, p. 30

C2450-6
10/12/88

FOOD
ENGINEERING
SINCE 1928. THE SOURCE ON PROCESSING, PACKAGING AND PRODUCT DEVELOPMENT


ISSUES
ANSWERS

FOOD ENGINEERING



COVER STORY
The '90s are almost here. Being ready for them is the processor's next major imperative.

Pages 103 to 133

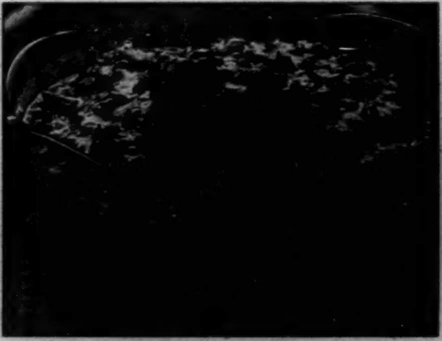
News

15 Industry Report
This month's Report talks about why a more open food market would improve global trade; why supermarkets are the barometer of American society; FDA's view that food labels are becoming more and more confusing; and the changes approved in the FDA revitalization bill.

41 Marketplace
Exotic sauces, spreads and seasoning pastes were the focus of the Fancy Food Show.

Departments

11 Editorial
12 Calendar
15 Industry Report
41 Marketplace
53 Packaging
174 New In Print
225 People



EXOTIC SAUCES: PAGE 41

Engineered Foods

70 Computer Modeling
Software developed to build molecular structures for the pharmaceutical industry is now being applied to food research.

74 Agricultural Biotechnology
The U.S. has long been the leading agricultural producing nation. Will we retain that position?

78 Tissue Culture
A better understanding of secondary metabolites is important in the development of strawberry flavor using tissue culture.

82 Shrimp Aquaculture
Shrimp aquaculture research is aimed at lowering feed cost, intensifying production and better disease control and detection.

91 Low-Fat Meats
Beef, pork, lamb and poultry products with up to 96 percent less fat, 30 percent less cholesterol contain 50 percent fewer calories.

92 Eliminating Blanching
Pyrophosphate technology cuts energy costs for frozen food packers and replaces sulfites for food service operators.

98 Choices
100 Literature

SHRIMP AQUACULTURE: PAGE 82

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) September 1988, Vol. 60, No. 9. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., one of the ABC Publishing Companies, a part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office © Chilton Company, 1988. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

Features

103 **SPECIAL REPORT—**
ISSUES & ANSWERS FOR THE '90s

104 **Consumers and Plant Design**
Consumers affect not only what products are on the market, but what products are manufactured.

113 **The Productivity Imperative**
The major players in the food industry must continually boost their productivity or lose both profits and market share.

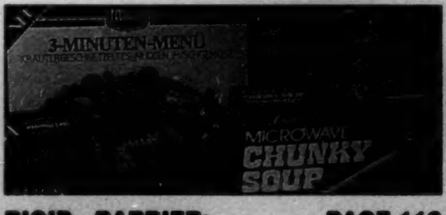
118 **Packaging Solutions**
Packaging for "market-driven" products may be solving marketing problems, but it is raising issues about food safety and the environment.

124 **Quality Control Moves On-line**
Moving instruments from the lab to a line across the building can sometimes be a quantum leap.

130 **Process Control**
More automation is just around the corner.

136 **Solving Problems on Micros**
Part two of this series explains how the process of programming languages for microcomputers has improved significantly.

145 **Cooking and Heat Exchange**
In the next decade, heat exchange equipment will need to help processors secure and extend unique market beachheads.



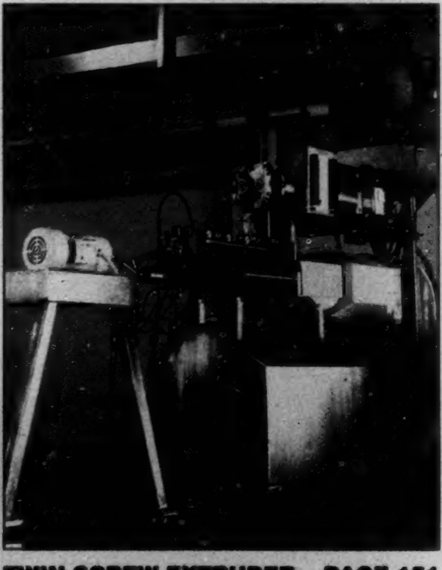
RIGID—BARRIER: PAGE 118

From the Field

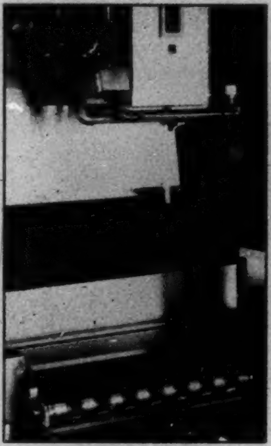
151 **SPECIAL REPORT—THE FUTURE OF EXTRUSION**
158 **There is a great need for more extrusion education**
162 **Extruder increases capacity of snack food line**
164 **Clutch with integral sprocket cuts wrapper maintenance**
166 **Chipboard partitions are best choice for inner packaging**
170 **Advances in statistical process control improves quality**

New Equipment

183 **Processing Equipment**
195 **Packaging Equipment**
209 **Instruments/QC**
216 **Sanitation & Maintenance**



TWIN SCREW EXTRUDER: PAGE 151



Special Emphasis

COOKING AND HEAT EXCHANGE

Processors are seeking cooking methods that offer alternatives to canning and hot filling, while at the same time offering products that meet consumer standards.

Pages 145 to 149

PACKAGING RAISES NEW ISSUES

Packaging for "market-driven" products may be solving marketing problems such as added convenience and freshness, but it's raising issues about food safety and the environment.

CHARLES E. MORRIS
Midwest Editor

Almost every "answer" to a food-packaging issue seems to raise yet another issue. Most current packaging issues concern plastics. Some major issues for the 1990s, as perceived by *Food Engineering*:

- Plastic packaging answering consumer demands for convenience and "freshness," as well as packer needs for extended shelf life and lower distribution costs, is raising issues about the solid waste stream.
- Retortable and aseptic products in rigid barrier-plastic containers have raised the issue of assuring seal integrity on-line.
- Controlled atmosphere packaging (CAP), aimed mainly at extending refrigerated shelf life of fresh meats, poultry and seafood, raises microbiological safety and plant-sanitation issues.
- Packaging materials for microwaveable foods are raising regulatory concerns. (Example: As this story went to press, FDA had scheduled a public meeting for September 22 in Washington, DC to address its concern with susceptor materials.)

The six-month cruise of the garbage barge *Mobro*, shown moored with its tug to an oil rig off Grand Isle, LA, focused public attention on the solid-waste crisis last year. Nobody would accept the scow's 3,000 tons of garbage from Long Island, where landfills were full. (Source: UPI/Bettmann)

Garbage glut

"Disposability" was once a packaging advantage. Not any more. The nation is running out of space for municipal landfills, the standard method of garbage disposal. Municipal landfills declined in number from about 18,000 in 1979 to little more than 6,000 today, and half of these will be filled up or shut down for environmental-contamination reasons by 1990. Siting new landfills encounters regulatory prohibitions and community opposition. State legislators are drafting bills ranging from a ban on plastic packaging that is not biodegradable or recyclable (California) to tax credits for recyclable and recycled materials (New York). Only 10 percent of municipal waste is incinerated. Reason: Nobody wants a municipal incinerator in *his* community.

And so, solving the solid-waste crisis looms as the overriding packaging issue of the 1990s.

According to a 1986 study conducted for the EPA by Franklin Associates, the nation's solid waste stream in 1984 weighed in at about 133 million tons, after 15 million tons (mostly newsprint and corrugated) had been recycled. Containers and packaging accounted for 32.7 percent, or nearly one-third of the total. Of this packaging waste, 47.8 percent was paper, 27.1 percent glass, 11.5 percent plastics, 6.4 percent steel, 4.6 percent wood, 2 percent aluminum and 0.6 percent miscellaneous. Although plastics accounted for only 7.2 percent of the total solid waste stream—probably far less than the public perception—that translates into 9.6 million tons and rising. Plastic waste is projected to reach 9.8 percent of the solid waste stream by the year 2000.

Experts agree that the solutions must combine several approaches, "an appropriate balance of reduction, recycling, waste-to-energy incineration, landfill and

3-MINUTEN-MENU
Del Monte
VEGETABLE CLASSICS
Campbell's
MICROWAVE
CHUNKY SOUP
Sirloin Burger

Microwaveable entrees and other convenience foods are starting to proliferate in retortable barrier plastic containers. (Source: EVAL Co. of America)

developing creative concepts and technologies," said Karl W. Kamena, director of government affairs for the plastics group at Dow Chemical USA, at Barrier Pack '88 May 18 in Chicago. Kamena envisions the profit motive driving both incineration and recycling of plastic waste. Plastics at 7 percent of the solid waste stream account for 25 percent of the energy recoverable from the waste stream, he pointed out. "It doesn't cost money to incinerate plastics, it *makes* money," he added.

Recycling plastics is more controversial, Kamena continued. But technology is less a deterrent to recycling than:

- Developing an infrastructure to collect post-consumer, potentially-recyclable waste feed,
- Developing useful products and markets for recycled plastics, and
- Making recycling profitable.

Kamena suggests reducing recycling costs by awarding a "cost-avoidance value"—money saved by not disposing of the product—to source-separated recycled products. "The $64,000 question, of course, is: Who gets to pay this cost-avoidance?"—industry or some level of government?"

The biggest recycling success story since WWII is that of the aluminum can, where a 20-year effort led by Reynolds and Alcoa now boasts a recovery rate of 50 percent. Glass manufacturers, through a multi-million dollar employee-funded effort launched in 1980, have boosted glass-bottle recovery to 12-15 percent and growing.

Industry and academe are both attacking the plastic waste problem. Last January, the soft-drink industry formed the National Association for Plastic Container Recovery (NAPCOR), which hopes to boost recovery and recycling of PET soft-drink bottles to 20 percent (to 36 million lbs.) this year and to 50 percent by 1992. Recycling research is under way at Rutgers, Michigan State, the Univ. of Toledo, and the New Jersey Institute of Technology. The Council & Plastics Packaging in the Environment, the Polystyrene Packaging Coalition, the Society of the Plastics Industry, and the Foodservice & Packaging Institute all have task forces addressing the solid-waste issue.

One interesting idea is to emboss plastic bottles and containers with a code indicating resin type to help recyclers identify and segregate plastics for recycling. Several states are considering such a law. Another creative (no, destructive) approach: plastic films and sheet incorporating corn starch to render them biodegradable. Starches for this application were recently introduced by St. Lawrence Starch Co. (Mississagua, ON) and ADM (Decatur, IL). The Illinois legislature recently passed a bill requiring landfills to accept yard waste only in biodegradable plastic bags incorporating at least 6 percent corn starch. (At this writing, Governor James Thompson had not yet signed the bill into law.)

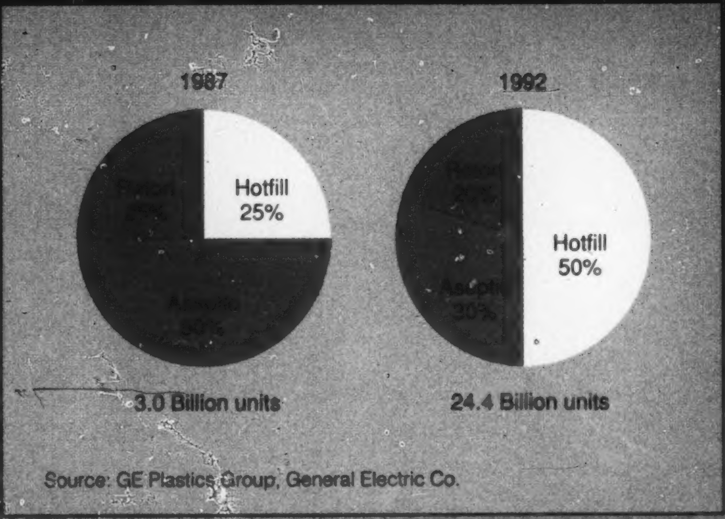
But solutions must start with long-term consumer education about the need to combine landfill, incineration and recycling.

On-line seal integrity

The issue of assuring seal integrity of aseptic products on-line was raised by Dr. Theodore P. Labuza of the University of Minnesota, 1988-89 president of the Institute of Food Technologists, in a recent interview with *Food Engineering* (July '88). "The biggest [aseptic] problem right now, which will impact on present products as well as on low-acid particulates, is that we don't have very good on-line ability to assure seal integrity, as we do on canning lines," said Labuza.

Timothy P. Flagg, national sales manager for TapTone division of Benthos Corp. (North Falmouth, MA), confirms that on-line seal inspection of aseptic products in rigid plastic containers with membrane seals is a problem, based on the many inquiries he has received from food processors and packaging equipment/material suppliers involved in aseptic packaging. TapTone has historically supplied on-line inspection equipment for cans and jars but has focused more recently on inspection systems for aseptic and flexible packaging, said Flagg. TapTone has developed two systems for on-line inspection of aseptic-container seals:

- The *Puffer-Profiler*, adapted from a sys-



Rigid barrier-plastic food containers will grow by more than 800 percent between 1987 and 1992, according to this projection. Hot-filled acid products will dominate. (Source: GE Plastics Group, General Electric Co.)

tem originally developed for General Foods' *Crystal Light* dry beverage-mix container. The Puffer applies heat to expand air or other gases in the headspace of the container, creating a bulge or "puff" in the flexible lid if the seal is good. No puff indicates a leaker. The Profiler is an electromagnetic sensor which measures the shape of the lid: Concave indicates a good seal, flat is a leaker. A mechanical-roller lid-depressor has been added to double-check for leaks. A rejector arm activated by the Profiler pushes leakers to a reject conveyor. TapTone is building a Puffer-Profiler system for on-line inspection of rigid plastic aseptic containers at a conveyor-belt speed of 80 ft. per minute, or about 240 cpm.

- *The Seal Integrity Tester* (SIT), originally developed for the Campbell soup-bowl container and targeted specifically at plastic containers with flexible-membrane closures. This system creates an enclosed chamber around the seal junction of the container and forces compressed air into the chamber. In this case, a puff in the lid indicates a leaker. A sensor above the line detects lid movement and signals a reject. One SIT currently operates at a line speed of 100 cpm.

Retortable plastic containers are more difficult to inspect. The technologies described above can't be applied because of their rigid metal closures, and the principles applied to can inspection won't work either because electromagnetic stress is absorbed by the plastic container and not conducted to the lid, Flagg explained. So TapTone is developing a rotary system with multi-head inspec- [illegible] will apply new container [illegible] plastic [illegible] will be ready in about [illegible] months, [illegible] said.

Microbiological concerns

Food safety during the 1980s has been characterized by two conflicting trends:

- Major foodborne disease outbreaks, along with recognition of the pathogenicity of certain microbes not previously known to be dangerous.
- Growing consumer demand for fresh foods, coupled with development of packaging technologies such as CAP/MAP and process/packaging methods such as *sous vide* designed to extend the refrigerated shelf life of fresh foods to meet this consumer demand.

This conflict has focused scientific and regulatory attention on plant sanitation; monitoring for microbiological contamination through hazard analysis of critical control points (HACCP); maintaining tight refrigeration control and monitoring time/temperature conditions throughout distribution; and developing faster microbiological tests using gene probes and enzyme immunoassays.

These trends will continue through the 1990s. "Packaging techniques for these [extended shelf life] products must be designed with a wary eye to the safety of these products," said Dr. Catherine E. Adams of USDA's Food Safety & Inspection Service (FSIS) at the Fresh Pack '88 conference January 20 in Chicago.

"Nearly all of the important foodborne microbial pathogens, with the exception of molds, are able to grow at various rates under modified-atmosphere conditions," warned Dr. Constantin A. Genigeorgis, professor of food safety at the University of California (Davis), at Pack Alimentaire. Risks can be minimized, he continued, by:

1.) Using ingredients with low counts of pathogenic bacteria.

2.) Use and continuous monitoring of thermal processes.

3.) Avoiding post-processing recontamination just prior to packaging.

4.) Strict adherence to low storage temperatures – as close as possible to 0°C.

5.) Formulating products to inhibit microbial growth in case of temperature abuse: for example, applying acidification, reduced water activity, antimicrobials and microbial competitors.

6.) HACCP throughout the processing, distribution and storage chain.

Needed, Genigeorgis added: better ways to [illegible] thermal [illegible] indica- [illegible] sub- [illegible] biological [illegible]

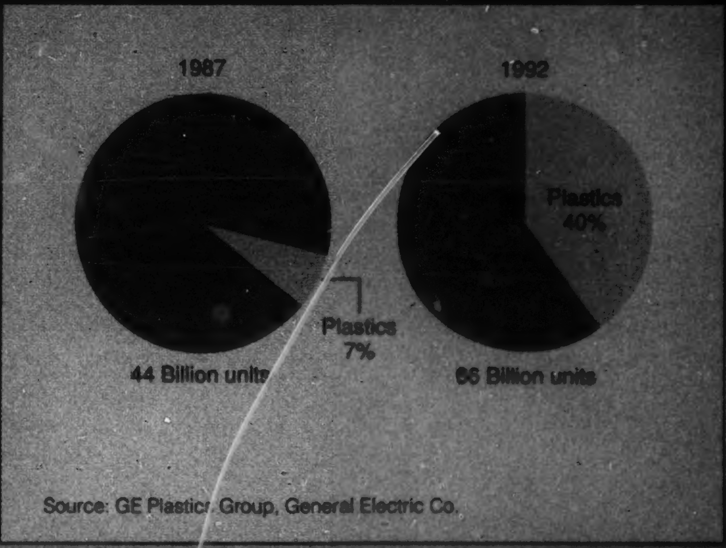
[illegible] key [illegible] CAP packaging of [illegible], said Dr. [illegible] A. [illegible] Associates [illegible]. "Without strict adherence to [illegible] environment, one might as well not consider CAP at all," said [illegible]. "This means training workers to understand and apply good sanitation."

Model for the fresh-foods plant of the '90s might be the new QP-1 central commissary started up early this year by Grand Union Co. at Newburgh, NY. The plant is designed to supply 92 "Market Square" deli departments in Grand Union Food Markets with prepared carry-out foods including soups, sauces, salads, meat and seafood entrees, and roasted meats. According to Robert Mohel, vice president of quality assurance at Grand Union, production and distribution are governed by a Total Quality Control (TQC) program incorporating high-tech "clean rooms," HACCP, microbiological lab analysis and time/temperature monitoring of all products, starting with raw materials and extending through production and distribution. Foods are packaged in gas-flushed barrier-plastic containers labeled with time/temperature indicators for monitoring thermal abuse and product shelf life. To meet current consumer health perceptions, products contain no preservatives or chemical additives. Grand Union maintains complete control of distribution from plant to warehouse to store via its own trucks and direct store-delivery.

Microwave concerns

Regulatory concerns about microwaveable packaging materials were discussed at Pack Alimentaire by Dr. Sara J. Risch of R&R Analytical, Inc. (St. Paul, MN). "The main regulatory issues are what the package is made of, and what happens to components of the package during microwave heating," Risch observed.

Traditionally, Risch pointed out, the microwave oven was used only to heat or reheat food. The package was heated only by conduction from the food and rarely reached temperatures above 212°F. The Code of Federal Regulations covers only packaging materials used up to or slightly above 212°F, specifying the total amount of non-volatile components that can be extracted by a food simulant.



Source: GE Plastics Group, General Electric Co.

Barrier plastics for convenience foods are projected to grow explosively in the 1990s. (Source: GE Plastics Group, General Electric Co.)

New microwave packages incorporating susceptor, reflector and field-modifying materials, however, can reach temperatures of 400-500°F, with localized heating approaching 600 degrees in some cases. Rising temperatures can cause migration of low molecular-weight compounds from the package to food. Under a strict definition of the Food, Drug & Cosmetic Law, any food product that contains contaminants from the package which are not approved food additives or GRAS is considered adulterated and subject to recall (although this has never happened).

FDA is concerned about what happens to the integrity of both food and package at these temperatures and has started to investigate the question, Risch reported. Although a test employing gas chromatography and mass spectrometry has been developed to detect, identify and quantify migrants from packaging materials, there is still a problem in identifying everything given off by the package. Another problem is finding a test medium to accurately simulate the food product: Foods themselves give off many volatile components that obscure the GC profile of the package.

Meanwhile, the burden of proof that a package is safe for its intended use conditions rests with the manufacturer. If existing regulations do not cover these, it is important to develop a viable test. In this case, Risch recommends contacting FDA for suggestions concerning appropriate tests.

Said Risch: "There is no doubt that there are concerns now which will lead to regulations in the future."

ON DECK: MORE PROCESS CONTROL

The food industry will be changing how it operates. Processing procedures will probably not change much in the next decade but more automation in the form of process control is definitely around the corner.

MARGIE J. RUSSELL
Technical Editor

Looking into the next decade, processing procedures and applications will probably not change drastically. Food products have always and will continue to be mixed, baked, cooked, heated, and cooled under a variety of conditions. *That* much will most likely not change.

Existing processing technologies will probably be improved. However, *how* the processing steps are completed will change proportionately as automation in the form of process control and information systems grows.

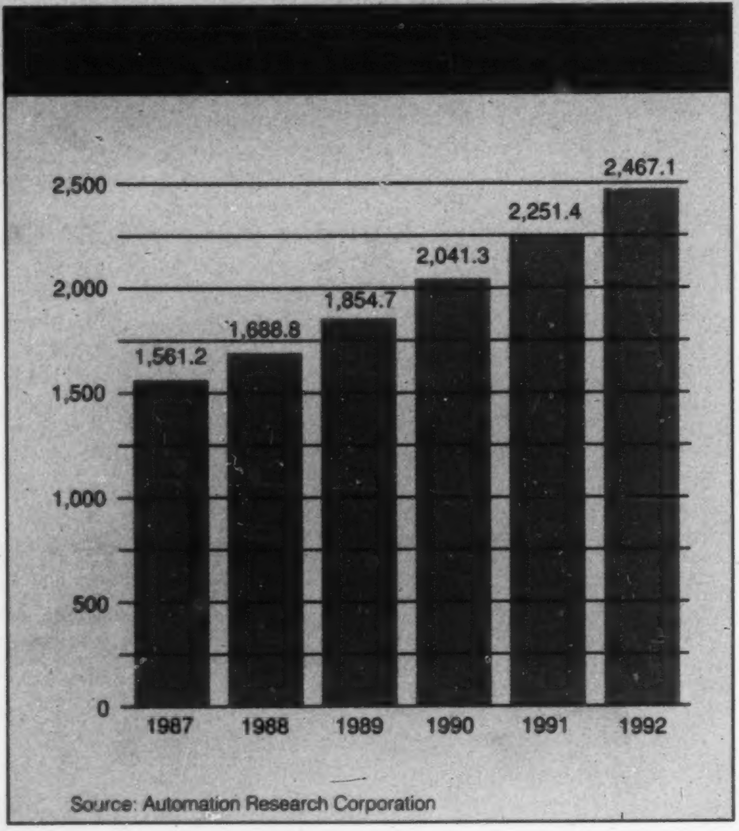
One of the main issues of processing and process control which will be carried into the next decade is that of production consistency. There is a need for processors to make a consistent product; deviations indicate poor management and poor quality control.

Another major issue in the processing area is a greater need for flexibility. Machinery and processing conditions should be available for changes; it is always vital to meet consumers' needs. Market share, too, is becoming more important. Competition is keen and some areas of the food industry experience rapid growth while some experience slow growth. There constantly seems to be a push for specialty items.

To meet these issues planning is needed. Process control makes the entire business/manufacturing scenario more effective. Production variables are controlled by automation and there is effective presentation of information as to how personnel, raw materials, and equipment are being used to produce a product.

The impact of automation on the food industry will get larger in the next decade. Automation Research Corporation, (ARC) Medfield, MA reports the U.S. market for factory management systems was worth in excess of $1.5 billion in 1987. ARC expects the shipments of factory management systems to grow at an average annual rate of approximately 10 percent through 1992, when the market will reach a value of $2.5 billion.

Currently, on the hardware side, factory management systems consist of cell controllers, personal computers, supermicros, and superminis. In 1987, approximately $40 million worth of cell controllers were shipped to manufacturers. The cell controller, combining the ruggedness of a programmable logic controller and the power of a computer, is the highest type of a factory management



Source: Automation Research Corporation

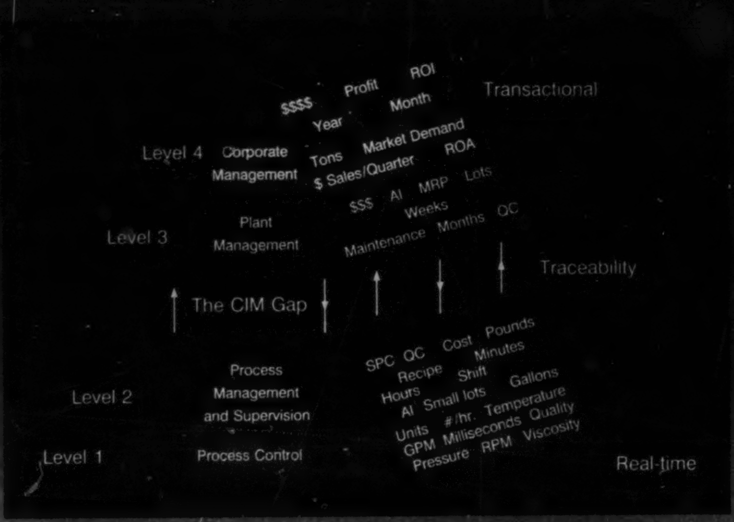


Diagram: Coopers and Lybrand, New York, NY.

system. ARC projects that $210 million worth of cell controllers are expected to be shipped in 1990.

[illegible] food industry consist of batch control systems. ARC estimates that $615 million worth of batch controls [illegible] was shipped in 1987. (See FE, July 1988 page 80). ARC also projects the sales of distributed control systems will continue to rise through the decade since the price of these systems will continue to fall making them more accessible to the smaller sized processor.

An industry viewpoint

The next progressive step in the process control area for the food industry now that the industry has implemented some forms of automation is the area of sensors, according to Joseph J. Barba, Manager of CIM and Factory Automation Practice, Coopers and Lybrand, New York, NY. "Sensors are becoming more sophisticated. Suppliers are beginning to understand what is needed," Barba explains. "They want to support the

Artificial intelligence techniques in processing applications

Researchers in Artificial Intelligence (AI) have developed numerous programming techniques that increasingly are being incorporated into business. However, use of AI techniques in process industries is still in the "let's try it because it's new" stage.

When discussing AI, there are two very different definitions to consider. A clear distinction must be drawn between a.) artificial intelligence as the *goals* of researchers in computer science, and b.) AI as the *computer techniques* that have been created during their quest. In many instances, AI technologies have facilitated the development of software that automates tasks previously too costly to attempt.

AI techniques were developed to solve classes of problems that were not readily solvable using functional programming methods or mathematical methods. In a processing application problem, AI techniques might be worth investigating if:

- The mathematics of the problem are undefined
- Operator experience is important
- Operator input is an important control parameter
- The control strategy changes frequently
- Complex judgments affect process performance.

All of these are examples where a greater degree of knowledge added to the control system potentially could have important payback. Each has a converse. AI techniques may not be of use if the problem is well characterized mathematically and little operator input is required.

Always, the first step is to identify important problems, and by important we mean that solving these problems would yield major benefits to the process plant owners. The best people are those thoroughly familiar with all of the process plant operations and economics and in many instances there are few people that knowledgeable.

The second step is to identify the causal factors leading to the problem. In most instances there is a causal chain that contributes to a problem rather than an isolated source. And, having identified the problem, it is now time to choose a solution.

Over the past several years, a synthesis of methodologies has resulted in "the method" which can be broken down into: functional analysis, data analysis, knowledge analysis, and business analysis. (See figure at right.) The method does not guarantee success but it does provide a framework which we have found useful for developing alternative solutions.

In functional analysis, the first step is to take the problem with all of its causal links and break it down into a set of discrete functions or tasks. In data analysis, a brief description is developed for each task concerning its inputs, outputs, and sources of control.

For each task in knowledge analysis, an analysis is done of the relationship between the inputs and the outputs of the task. A transfer function may be sufficient to describe the relationship. From an AI point of view, the most interesting tasks are those for which no transfer function can be written.

In business analysis, each of the tasks should be characterized as to its importance to the business aspects of the problem.

For each potential solution, "the method" should provide the informa-

[illegible] systems are beginning to mature. "The systems are still evolving. Their payback is definitely worth the initial costs that a processor must lay out. This payback is seen in reduced waste, increased productivity, and the ability to introduce and change products easily," Barba explains.

The accompanying diagram, a CIM Pyramid, is a theoretical model that represents

[illegible] the subject of CIM from an information scope, than it is here, he explains.

Technology and tools are used to collect and share information and this data is important to everyone in the process and the business. "The manufacturing scenario must convert business strategy to CIM strategy. We must close the gap between manufacturing and management. This will allow total information integration."

This schematic represents the method, a framework which provides a way to select solutions for processing problems with the aid of artificial intelligence and provides the information required to assess the impact of a given change.

---

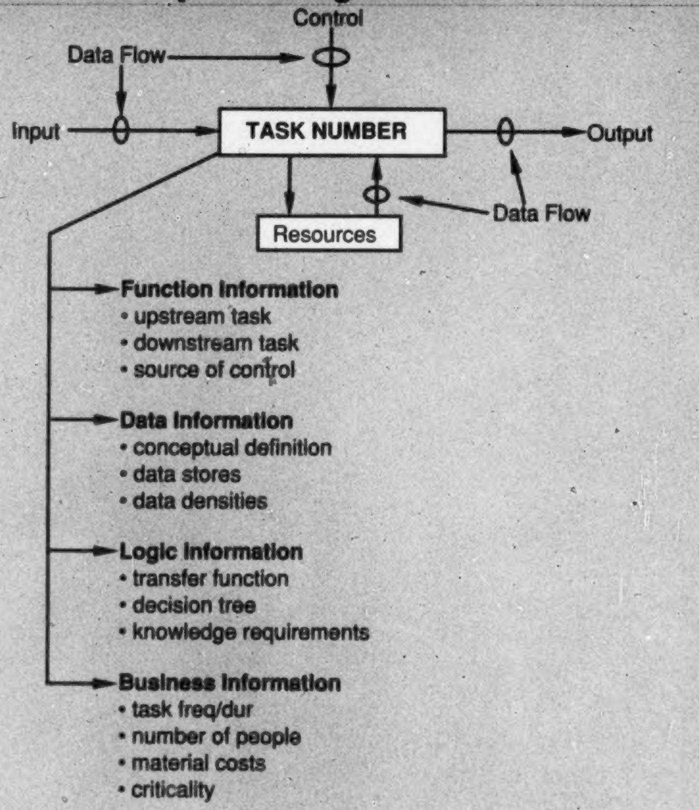
tion required to assess the business impact of a given change. The only additional factors needed are the estimated costs of implementing a given solution.

The following is a list of apothegms for successfully using AI techniques:

- A good business case is the single most important factor in determining project success.
- The most successful AI systems are tightly integrated with traditional computer systems.
- The quality of the knowledge being encoded using AI techniques is the primary determinant of value.
- The greatest ROIs arise from using technology to do things differently, now simply faster.
- Success requires all the traditional programming skills plus mastery of the new AI techniques.

James R. Davis, Combustion Engineering, Inc., Windsor, CT, and Eli Nisenfeld, Combustion Engineering, Inc., Riderwood, MD, from a paper presented at the ISA/FPID Spring Symposium, April 1988, Minneapolis, MN.

An information flow system used to provide processing solutions


Control
Data Flow
Input
TASK NUMBER
Output
Data Flow
Resources
Function Information
• upstream task
• downstream task
• source of control
Data Information
• conceptual definition
• data stores
• data densities
Logic Information
• transfer function
• decision tree
• knowledge requirements
Business Information
• task freq/dur
• number of people
• material costs
• criticality

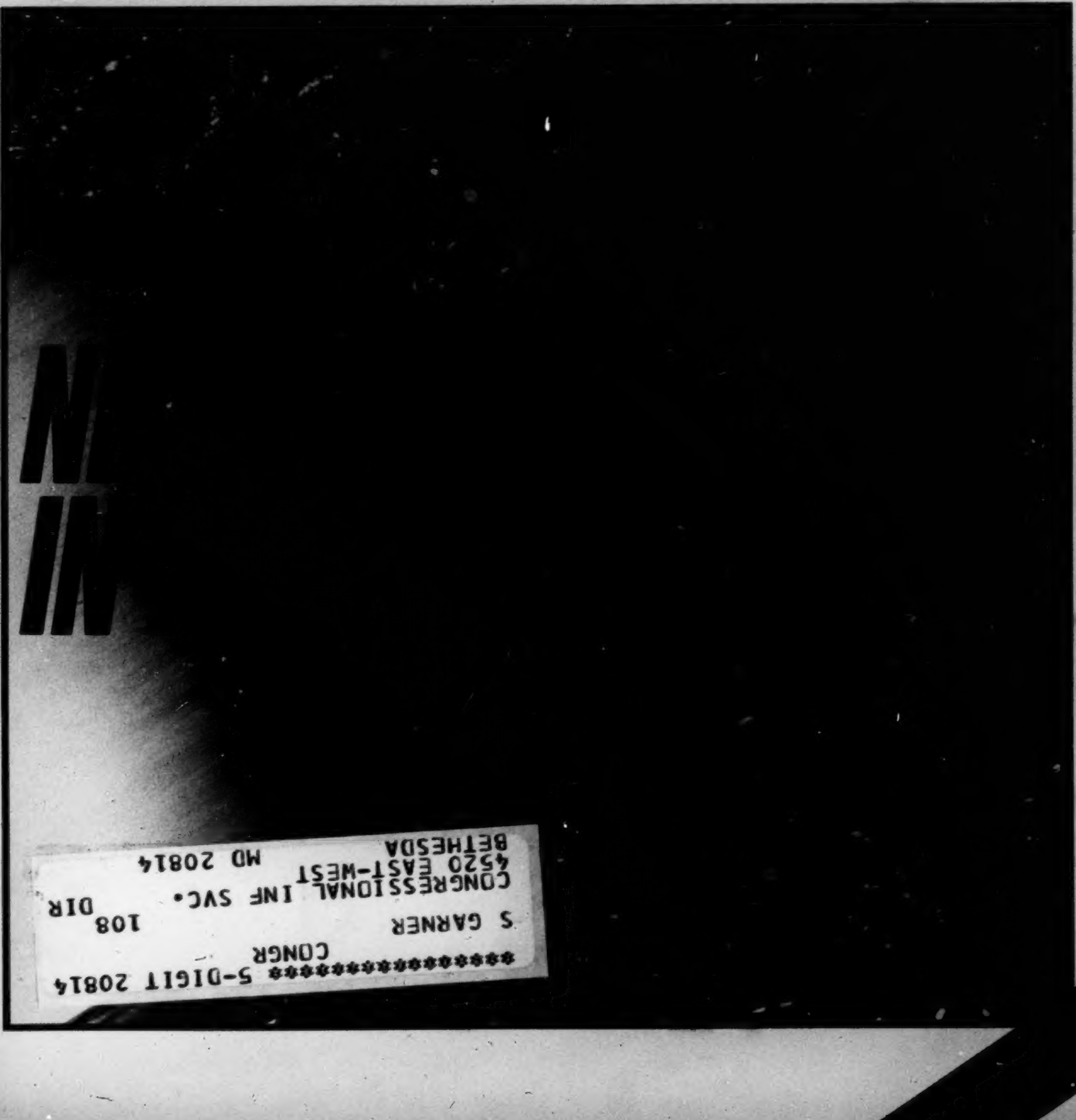
Source: James R. Davis and Eli Nisenfeld, Combustion Engineering Inc., Windsor, CT

C 2150-6
10/26/88

CHILTON'S OCTOBER 1988

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT



*************** 5-DIGIT 20814
CONGR
S GARNER 108 DIR
CONGRESSIONAL INF SVC.
4520 EAST-WEST MD 20814
BETHESDA

FOOD ENGINEERING

COVER STORY

The opportunities for food packaging today are just short of astronomical. On the cover, sheets of steel begin the production of food can containers as waves of plating solution flow over a sheet of steel. Photo courtesy of National Steel, Pittsburgh, PA.

Pages 63 to 73

Permission to photocopy for internal use or the internal use of specific clients is granted by Chilton Company for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $1.00 per copy of the article, plus 25¢ per page is paid directly to the CCC, 21 Congress St., Salem, MA 01970. Special requests should be addressed to The Editor. (0193-323X/85 $1.00 + 25¢)

FOOD ENGINEERING® (ISSN 0193-323X) October 1988, Vol. 60, No. 10. Published monthly by Chilton Company, Chilton Way, Radnor, Pa. 19089 (Telephone 215/964-4000). Chilton Co., one of the ABC Publishing Companies, a part of Capital Cities/ABC Inc., New York, N.Y. Second Class Postage Paid at Wayne, Pa. 19087 and additional mailing offices. Title registered in U.S. Patent Office ™Chilton Company, 1988. All rights reserved.

POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 2035, Radnor, PA 19089.

News

13 Industry Report

This month's Report talks about how Northern Ireland is courting U.S. food processors; the drought's effect on packaged food; and the National Academy of Sciences' belief that HACCP may be a "vaccine" against poultry contamination.

21 Marketplace

This month's report focuses on the competition among the manufacturers of adult frozen novelties.

Departments

9 Editorial
10 Calendar
13 Industry Report
21 Marketplace
29 Ingredients
125 New In Print
138 People

Brownie Sundae
6

ADULT FROZEN NOVELTIES: PAGE 21

Food Packaging

38 Synchronized Labeling

System synchronizes labeling speed with linespeed to apply 500 to 1,000 pressure-sensitive labels per minute accurate to within 1/64th-inch.

42 Degradable Plastic

Degradable plastic packaging sounds like an easy answer to the plastic-waste problem, but is it cost justifiable?

46 One Stroke Cans

New plant supplies pet food packer with aluminum cans produced at rates up to 3,780 per minute on two presses.

50 Receptor Films

Product and packaging materials must work together when designing for microwave cooking and browning.

53 Seafood CAP

New controlled-atmosphere package extends refrigerated shelf life of seafood to seven days after thaw from frozen state.

56 Tritello Container

Tamper-evident container offers flexibility for single and multiple serving applications.

60 Literature

ALUMINUM CANS: PAGE 46

CHILTON
FOOD
GROUP

Features

63 The Packaging Boom
Packaging technologies continue to make inroads in the food industry. New package designs are being formulated out of several new materials. But, as the numbers indicate, there is still a lot of room for the old standbys such as glass and steel.

77 Fiber Formulations
Despite the uncertainty of fiber's role in disease prevention, the recommendation from the Surgeon General is clear – Americans should increase their complex carbohydrates and fiber intake.

91 Packaging Buyers Survey
As packaging technologies expand, so do the desires of the users of those technologies.

98 Pack Expo 88
Returning to Chicago could make the difference in Pack Expo's expected record breaking attendance for both exhibitors and visitors.

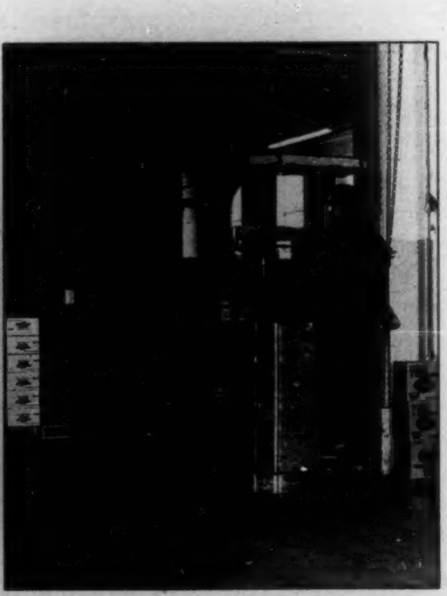
PACK EXPO: PAGE 98

From the Field

107 Distributed process control boosts starch yields
110 Thermoplastic chain ends downtime, cleanup worries
113 Accurate inventory control for distribution center
116 Brewpubs carve niche in flat beer market
120 Low-cost solutions for process control interface

New Equipment

129 Processing Equipment
133 Sanitation & Maintenance
136 Handling & Distribution



INVENTORY ON PCs: PAGE 113

Kellogg's
RAISIN
BRAN

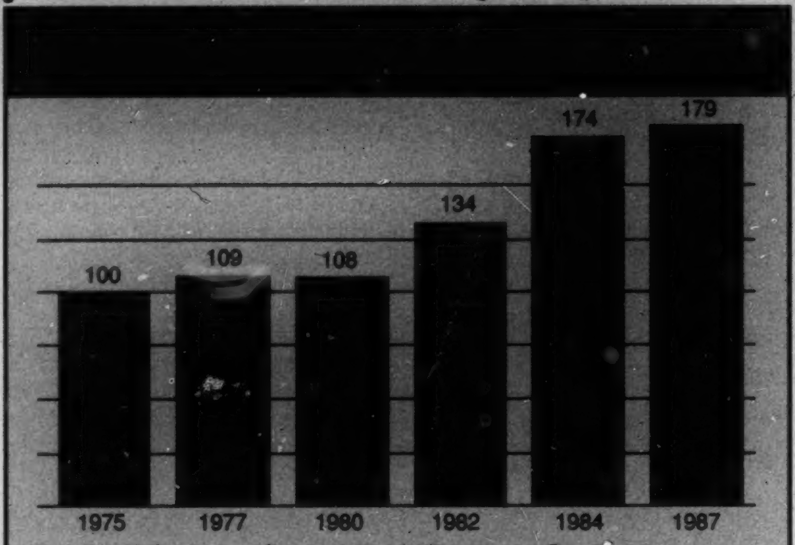
Special Emphasis

FIBER FORMULATIONS

New fiber-added foods are meeting with success in the marketplace.

Pages 77 to 88

Northern Ireland courts U.S. food processors into land of plenty



Source: U.K. Employment Gazette; Industrial Development Board for Northern Ireland

Northern Ireland's productivity, measured as output per employee per hour, exceeds that of the U.K. at large and is continually improving. (Source: Northern Ireland Industrial Development Board).

Bombings and assassinations are all most Americans ever read about or see on the evening news about Northern Ireland. Yet the murder rate there is one-third the average for all U.S. cities with populations of a quarter-million or more, according to U.S. and U.K. crime statistics. You're five times more likely to get murdered in Detroit, and 4.5 times more likely to get murdered in Washington, D.C. than you are in Northern Ireland.

In spite of the "sectarian" violence afflicting the province, Northern Ireland has a good story to tell as a prospective site for American food processors eyeing the 320 million consumers in the European Common Market, which by 1992 will have eliminated all remaining trade barriers between member nations. The Northern Ireland Industrial Development Board (IDB) has targeted food processing as one of the major industries it wants to attract and is actively courting U.S. food processors to locate plants and/or establish joint ventures in Northern Ireland. According to D. James Gray, industrial-development consul for the Midwest at the British Consulate-General office in Chicago, Northern Ireland "has the best industrial-relations record and the best productivity record in Europe—although the West Germans might dispute that." Gray sees Northern Ireland as "the gateway to the Common Market" where American marketing savvy can join with European technology and local raw materials to meet consumer demand for convenience foods in Western Europe.

Advantages, incentives

Advantages of Northern Ireland to the U.S. food processor:

- *Location*: Proximity to Western European markets and entree to the Common Market.
- *Raw materials*: Food production, mainly livestock, is Northern Ireland's No. 1 industry. Major products: beef, lamb and milk. 1986 production (farm-gate prices): £281 million of beef and sheepmeat, £196 million of dairy products, £215 million of hogs, poultry, eggs, shell fish, fin-fish, fruits and vegetables—from a province the size of Connecticut. The province prides itself on its disease-free livestock.
- *Labor*: A skilled, well-educated, English-speaking and highly productive labor force with a traditionally strong work ethic. Productivity in Northern Ireland exceeds that in the rest of the U.K., yet wages are lower. Less than half the labor force is unionized, and unions are "cooperative," says the IDB.
- *Infrastructure*: Utilities—electrical, LPG gas and oil—are all in place, and the province has plenty of fresh water (enough to allow every industrial user 26,000 free gallons per month). "Magnificent" roads make any airport or seaport no more than 2½ hours away. Five commercial seaports with roll-on/roll-off facilities serve world markets, including 150 sailings per week to other U.K. ports. Telecommunications allow direct dialing from any phone to 116 countries. Telex and data-transmission facilities are expanding rapidly.
- *Education and R&D support*: According to Billy Trimble, food industry manager for the IDB, Queen's University (Belfast) offers programs in food chemistry/biochemistry and animal nutrition and offers R&D facilities for irradiation, mass spectrometry, NMR spectrometry and sensory evaluation. The Department of Food & Agricultural Microbiology is involved in R&D projects relating to novel heat treatments for milk, vacuum packaging and controlled-atmosphere packaging, irradiation, genetic engineering, enzymology and rapid microbiological detection methods.
- *Quality of life* includes a mild climate, a pollution-free environment, uncongested roads, "outstanding" schools and recreational facilities.
- *Incentives*: Food processors interested in Northern Ireland need deal with only one agency—the IDB, which offers a wide range of customized incentives. *Capital* incentives include building grants, rent grants, machinery/equipment grants and no property taxes. *Revenue* incentives cover start-up grants, interest-relief grants, training grants, moving allowances for key workers, R&D grants and market-research grants. *Tax* incentives offer tax-relief grants and tax allowances on buildings and equipment. *Financial* incentives include loans and venture capital. For further information, contact: Industrial Development Board for Northern Ireland, IDB House, 64 Chichester Street, Belfast BT1 4JX, or the British Consulate nearest you.

PACKAGING STATUS REPORT

THE PACKAGING BOOM CONTINUES

Packaging technologies continue to make inroads in the food industry. New package designs are being formulated out of several new materials. But there is still a lot of room for the old standbys such as glass and steel.

You can see it anywhere. Glass bottles, paperboard containers, "flexible" packaging, microwave containers, aluminum cans, and plastics. What is it? Food packaging, of course!

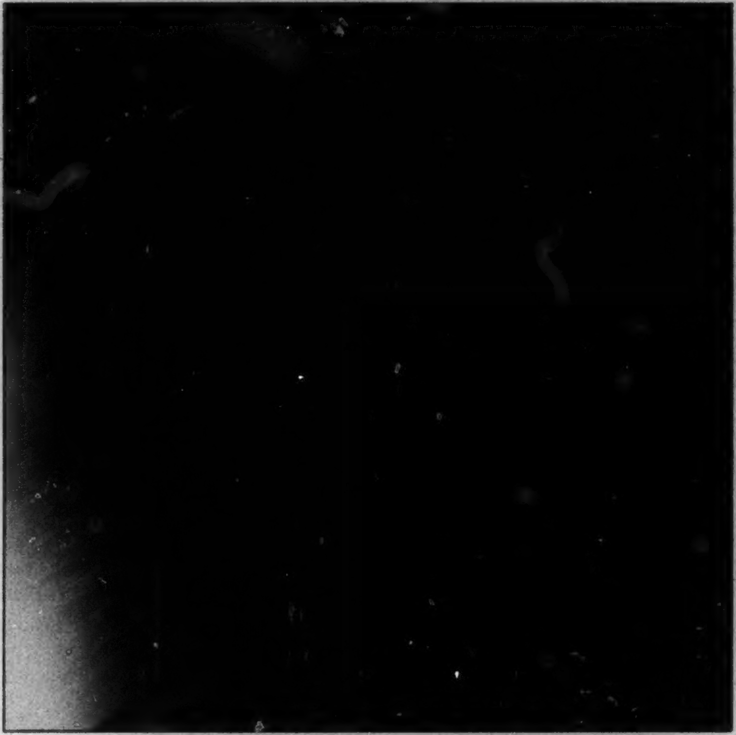
The opportunities for food packaging today are just short of astronomical. The development of containers and packages is so rapid and adaptable that the packaging sector can quickly meet the demands of an industry that is governed by consumers' whimsical tastes and desires.

To see a wealth of opportunities, for example, take a look at some of the significant products that have been developed within the last year or so. Hormel's *Top Shelf* is a shelf-stable, microwaveable entree that needs no refrigeration. *New Traditions*, also marketed by Hormel, is a microwaveable sandwich line—chicken sandwich and bacon cheeseburger. Perdue Foods, Inc. successfully marketed chicken parts using modified atmosphere packaging. And, the most recent development to date, is the successful application of the *Crosscheck* packaging system for Seneca applesauce into individual single serving containers.

Segment forecasts

According to the U.S. Industrial Outlook, published by the U.S. Department of Commerce, every segment of the food packaging industry will show growth throughout 1988. The main categories of rigid containers (metal cans, glass containers, plastic bottles) and sanitary food containers (paperboard, aseptic paperboard food containers, ovenable paperboard trays and containers) will see anywhere from two percent to five percent increases in shipments and usage for the next year.

MARGIE J. RUSSELL
Technical Editor



Source: National Steel Corporation, Pittsburgh, PA.

Specifically, the Department of Commerce reports that product shipments of rigid containers rose 5.4 percent in 1987. In terms of market share, 31 percent of those containers went for soft drinks, 30 percent for other beverages, and 27 percent for food. But the market share by package type remained unchanged from 1986—metal cans, 59 percent; glass, 23 percent; and plastic, 18 percent. For 1988, DOC projects metal can shipments will increase 4.6 percent over 1987, glass containers will be up 2.6 percent, and plastic bottles up 12 percent.

The agency also reports an increase in the value of shipments for sanitary food containers in 1987. This segment showed a two per-

←Circle 36 or see FEM, p. 175

ICI Americas, Inc. produces its Melinex line of films from polyester.

cent increase in 1987 and is expected to rise the same in 1988. Sanitary containers accounted for an estimated 13 percent of the constant- and current-dollar value of shipments of all types of paperboard containers.

What's going on

The glass container industry has had its share of ups and downs over the past few years but now it can look forward to "up." Several company consolidations and mergers, the rising prices of plastic and aluminum, and consumer awareness of recycling programs all add up to a projected strong year for glass.

The glass industry has directly helped itself, too, by improving production techniques and introducing new product shapes. For example, the industry has introduced a 20-ounce nonreturnable bottle for soft drink beverages at about the same cost of producing a 16-ounce bottle. And, best of all, the bottle is recyclable, like all glass.

Since its products are rather easy to recycle, it is no surprise that the glass industry promotes many of the nation's curbside recycling programs. Watchers of the industry took note when Owens-Illinois, Inc., Toledo, OH acquired Brockway, Inc. this year. The glass giants will become one of the largest players in the industry and O-I has always been a leader in promoting recycling programs, which the industry overall has spent more than $15 million to support.

While the glass industry might be helped by the rising cost of aluminum, it is certain

Designing food packages for recyclability

One of the nation's leading authorities on recycling, Edmond Carreras, says "the largest volume of products going into landfills today is packaging materials. It doesn't have to be this way. Virtually all packaging materials are recyclable."

Carreras heads a national recycling task force organized by the Society of Packaging and Handling Engineers (SPHE). The task force is developing packaging guidelines for use across all industries and is assisting federal, state, and municipal governments in policy-making.

"Aluminum, glass, and paper have successfully been recycled for years," Carreras says. "Today, certain plastics used in food packaging can be recycled into building materials, carpets, and even clothing. The technology exists and is working."

Recycling is now a high-tech industry, says Carreras. "It used to be primarily low-tech and labor intensive," he explains. "It consisted of manually sorting the different materials. However, today food packaging is more complex because it is designed to lengthen shelf life and protect the consumer from tampering."

He cites the example of dry soup mix. Individual portions are packaged in laminated materials—aluminum, plastic, and paper. Four or five layers may be used to protect the product: an aluminum layer keeps moisture out, plastic adds strength, and paper allows for a printed message. Additional layers are often required between the others to make them adhere. Then the individual packets are inserted in a box. Recycling such composite packaging involves processing multiple types of materials. It is complicated but entirely possible with today's technology.

"We're trying to extend the life cycle of packaging materials," Carreras says. He says a package may have a six-month life cycle in the food industry, then be recycled into a non-food product such as a pallet for another five years, then finally be recycled into a building material for a 30-year life cycle. Recycled plastics are used in such building applications as bathtubs and sinks. A new type of two-inch by four-inch post made of recycled plastics using multiple materials is gaining wide acceptance proving more durable than the standard wooden 2 X 4.

Unlike glass and aluminum, plastic is forbidden by the FDA to be reused as food packaging. The reason is that if the consumer uses a plastic food container to store pesticides, for example, the container will absorb minute but detectable traces of cancer-causing chemicals.

What does all this mean to the food processor? It means that the issues of recyclability and disposability must be addressed at the very earliest stages of new package design. The designer should satisfactorily be able to answer such questions as: Can this package by recycled? Are the package and material biodegradable? If they are biodegradable, what are the by-products, and are they safe for the environment? Can the package be safely incinerated? Forethought and consideration of the post-consumer phase must be incorporated into the packaging design.

The question legislators and industry are struggling with is "Who is responsible for ensuring that a package can be disposed of or recycled?" Is the package materials supplier responsible? Or the packager?

Some large food companies today are accepting corporate responsibility for the recyclability and disposability of their product packaging. They have made it corporate policy to use only recyclable or biodegradable materials.

"If the material is not recyclable and the food processor does not have a good plan for disposability, legislators will ban the product," he explains. "Government is putting the responsibility on the food processor to use acceptable packaging materials."

"Before making a major investment in new packaging, the food processor must be able to demonstrate how the packaging can be effectively disposed of or recycled," Carreras advises.

the aluminum can segment is suffering from the price increase. Rising raw material costs have kept profit quite low in the past year for the aluminum can market. However, a new product in the beverage market, the 24-ounce can, has shown acceptance among consumers in some limited test markets.

Manufacturers have introduced aluminum to the packaging industry for other uses besides cans. Take sugar for example: *Montgomery Sugar's Golden Granulated* is packed in a golden aluminum foil bag. Industry sources are also advocating the use of foil trays in microwaves as being completely safe.

Probably the largest growing area right now in packaging is the flexible segment. Some industry sources feel that flexible packaging—aseptics, retort pouches, dual-ovenable, paper—will eventually replace other packaging alternatives. The reasons for this? There are several: it is cost effective; flexible packaging can replace rigid containers; semi-rigid containers may be developed as alternatives to rigid and flexible containers; and flexible packaging is energy efficient. It takes less energy to make and recycle some forms of flexible packages than it does to make and recycle aluminum.

The most rapidly growing product in the flexible packaging segment is aseptic packaging. Aseptics provide many benefits: no refrigeration, extended shelf-life, convenient to carry, easily disposable. An estimated 5 billion package units were sold in 1987. The most popular aseptic product is fruit juice

"Otherwise, environmentalists and legislators may force the product to be discontinued and the company could lose a great deal of money."

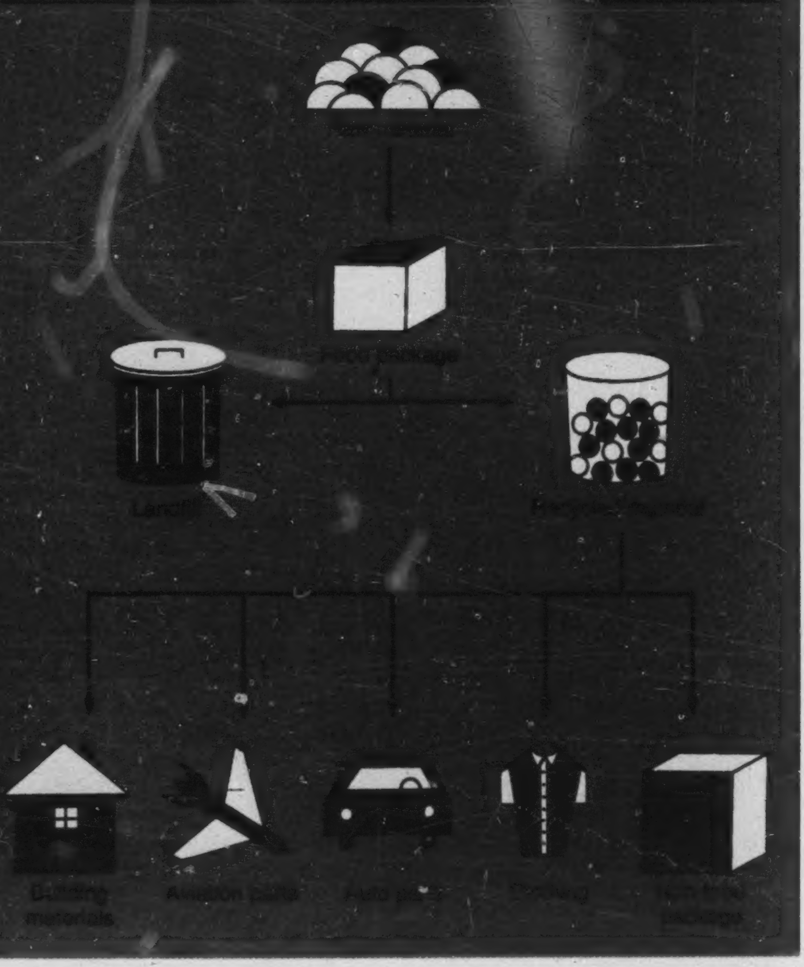
Legislators are formulating laws stating that the food processor has ultimate responsibility, Carreras says. He has a unique vantage point on government activity. His recycling task force is receiving continuous requests to speak to legislative bodies at all levels across the country. They are also providing technical assistance to legislative personnel in developing recycling and disposal policies.

"The food industry has never before had a formal method to effectively plan for recycling and disposability," says Carreras. "The guidelines will give them the direction they need to make informed decisions."

Edmond J. Carreras is a principal engineer at the engineering and construction firm of Day & Zimmermann, Inc., Philadelphia, PA. He is a certified professional packaging engineer and a member of SPHE, the Society of Plastics Engineers, the Technical Advisory Service for Attorneys, and the American Society for Testing and Materials.

The recycling guidelines being drafted by the SPHE are available from Ms. [illegible] Mitchell, SPHE Headquarters, Reston International Center, Reston, VA 22091.

The extended life cycle of packaging material



which sold 2 billion units (U.S. Industrial Outlook).

Steel rises again

Steel in food packaging is enjoying a resurgence. Steel cans are viable packaging options to the industry – when prices of other materials rise, steel drops or remains the same. It is easier to manufacture something out of steel when compared to other packaging materials and the materials can be easily recycled.

Steel also provides its own safety features. Tamper evident seals are never needed – the steel can provides its own. Steel companies have made an effort to manufacture ultraclean, light gauge steel cans – the steel is lighter and provides more cans per ton. The end products are cleaner cans for beverages.

Approximately 95 percent of the cans produced for food are steel. In 1987, 28.4 billion were produced but a drop is forecast for 1988 to 28 billion due to the drought and a fire at a major steel facility. A rebound is forecast for 1989, projected to equal the 1987 mark.

The major technology still developing in

Issues to consider in food package development

[illegible] package development is growing in complexity as consumers become more sophisticated and demand high quality food products with freshness, flavor and convenience. Retailers are employing new methods of monitoring consumer preferences on a close-to-real-time basis, thus creating another source of demand. Simultaneously, the range of materials, processes and systems available to support the development of new packaging is expanding beyond the ability of food processors and suppliers to select compatible packaging that is fully integrated with the food product.

Often, promotion and packaging [illegible] have potential influence on the success of a product. However, what is not always evident is the dual nature of the key role packaging plays in the success of a product. Packaging may be the primary source of product differentiation. At the same time, it is typically an integral part of the food product and should be developed as such. Decisions that assure the compatibility and consistency of the processing and packaging choices must be made in [illegible] development. The key way to assure this consistency is to involve [illegible] all aspects of producing production and marketing such as manufacturing, packaging, distribution, and product/process development. [illegible] food packaging development are equally important. Failure to recognize [illegible] are important can result in failure to deliver the product.

At first, it is essential to develop a clear understanding of the overall product concept within the context of the company's corporate goals and objectives. A decision is made whether this product represents a design project or a development project.

As a second step, a multidisciplinary team is formed to ensure that packaging is considered as an integrated system with the food product. The leader is responsible for keeping the focus of the study on the ultimate product while each component aspect is studied in detail sufficient to allow the early identification of potential problems in the critical path to development.

A product blueprint is developed to formalize the focus of the package concept. Sensory and physical attributes which make the product unique or superior to similar products are identified. The protection requirements of the food product are listed and considered in the context of the effect of the critical preservation techniques necessary to keep the food. Compliance requirements of the regulatory agencies are factored into the considerations of product-container compatibility. Materials and production systems which are already available are also identified.

After the product blueprint is completed, concepts for the packaging are generated. It is especially important that more than one concept be developed so that alternatives may be considered. The chance of success greatly improves if a viable alternative, with open avenues to vendors, is maintained throughout the process.

The influence of new technology is an important factor in the evaluation of the proposed concept. But other factors must also be considered. Potential suppliers should be evaluated on a number of criteria. Their ability to meet the technical specifications of the product must be coupled with an ability to supply sufficient quantities on a continuing basis. Evaluation of all factors will lead to the identification of critical paths to development for the concepts. These critical paths will include all issues which may affect time projections.

Given that the choice of packaging can have a major influence on the success of a product, it is critical that the proper choice be made. The expanding range of options available for food product packaging adds to the complexity of these choices. A decisional emphasis on gaining market share can accelerate the product development process to the point that the focus shifts from the quality of the product. Adequate time must be allowed to develop the appropriate documentation so that potential problems are identified early and resolved. Whenever a company's existing staff does not have sufficient expertise to address all the issues involved in the development of a new food product package, management should determine if the need is to address a specific problem or for overall project management. Otherwise, experienced outside resources should be sought early in the process.

T. Hamilton, P. [illegible], M. Miller, E.J. Stilwell, R. Whelan, Arthur D. Little Center for Product Development, Cambridge, MA the steel can segment is the "draw-redraw" can, which is a two-piece can like aluminum. This product is expected to makes gains in the soft drink industry. But, the jury is still out on the easy-open steel end can – industry sources do not know if it meets consumers' needs.

Combos
Combos

Shown are various forms of oriented polypropylene film from Hercules, Inc. The films are used in the snack food market since they provide many barrier properties.

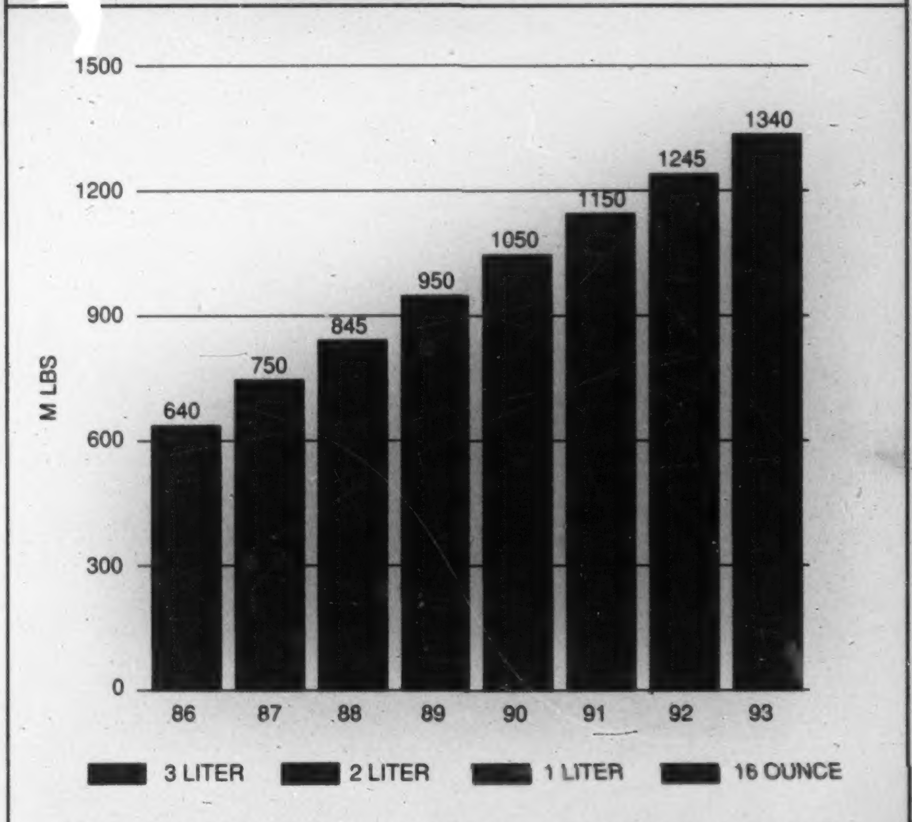
Speaking of plastics

Unless you have been hiding under a rock for the past several years, it is common knowledge that the biggest player in the packaging industry is plastic. Since the advent of plastics in 1970, this versatile material has threatened almost every segment of the industry. There are many advantages to plastic: it is shatterproof, light weight, reclosable, and has clarity.

The most popular polymer in use today is of course PET. Eastman Chemical Products, Inc., Kingsport, TN reports the demand for PET containers in 1987 was 9.5 billion containers for all types of food and general packaging. The estimated total for 1988 is significantly higher at 11.4 billion. The soft drink market is the largest user of PET containers, where 749 million pounds of PET was required for production in 1987, and an estimated 845 million pounds is needed for 1988 production. (See accompanying chart.)

The packaging industry is demanding more plastic but the industry may not get it. For the first time since its introduction, suppliers are facing a shortage of plastic in their

PET consumption (by bottle size)



Source: F.W. Voigt, Jr., Eastman Chemical Products, Inc., Plastics Division, Kingsport, TN supply lines. Ethylene, the primary raw material used in producing plastics, is in short supply, mainly because of an explosion and fire at Shell Oil Company's refinery in Norco, LA. Shell is a major ethylene producer and the explosion damaged two olefin plants and cut the company's production by about 60 percent. This in turn affected the entire market and caused an increase in prices in an industry that has had traditionally low prices.

Spot shortages may be the only immediate evidence of the decreasing supply. But sources feel that the industry is at a critical point where demand is exceeding supply. Usage and consumption have increased at much faster rates than were ever predicted.

Specialty films

Despite shortages and rising prices, there is probably no greater diversity in film production than that found in the snack food industry. Snack food packaging must unequivocally meet the demands of the product: moisture protection, oxygen and light barrier properties, compatability with machinery, and ability to provide a good billboard for the product.

A continuing trend in snack film production is one of replacing paper substrates with oriented polypropylene (OPP). Approximately 60-70 percent of the flexible packaging in snacks is OPP which falls into three main markets: clear, metallized, and opaque. In particular, metallized OPP is the fastest growing plastic snack film today, where wide usage is seen in the microwave popcorn segment of the the snack food market.

What's on the horizon?

The packaging industry, even though it has a wide host of opportunities before it, faces some real challenges in the years ahead. It is true that there are more packaging opportunities in this country now than there ever were in the past. However, we are facing a problem of packaging developers who are rushing products into the marketplace before they are really ready for consumer use. Development is being overstated while application is being understated. Machinery manufacturers, film companies, converter companies, and processors must all keep open lines of communication in order to develop the best form of packaging applications.

Another issue which the industry must address in the future is that of waste disposal. The situation appears to be reaching a pinnacle—landfills are reaching their fill points. And even though many materials are too expensive to recycle, consumer interest is rising when it comes to recycling packaging materials. A poll conducted by the Gallup Organization, Inc. asked consumers: "What would you do if you knew a certain food or beverage container could not be recycled?" More than half of the respondents, 54 percent, said they would switch to a container that can be recycled, 33 percent said they would not switch, and 12 percent did not know.

Many states are introducing legislation to ban the use of various packaging materials. The strictest ban is planned to go into effect next year in Suffolk County, NY where a total plastic ban has been proposed. As expected, industry organizations are rallying to fight the ban, including the Society of the Plastics Industry, the Flexible Packaging Association, and the Polystyrene Packaging Coalition. As consumers, do we demand more complicated packages or a safer environment? And, can we have both?

PACKAGING STATUS REPORT

[redacted]

MARKET	1985	1986	1987[1]	1988[2]
TOTAL	253.5	262.5	274.6	285.8
Food	83.7	88.0	94.2	101.7
Beverages	60.1	59.9	60.2	60.5
Beer	83.8	86.9	89.5	91.3
Liquor	11.9	10.9	11.0	11.1
Wine	14.0	16.8	19.7	21.2

[1] Estimated.

[2] Forecast.

Source: U.S. Department of Commerce: Bureau of the Census and International Trade Administration. Industry sources.

[redacted]

MARKET	1985	1986	1987[1]	1988[2]
TOTAL	97.9	100.7	105.2	109.7
Beer	35.6	36.0	37.0	38.0
Soft Drinks	34.5	36.8	41.0	44.1
Food	27.8	27.9	27.2	27.6

[1] Estimated.

[2] Forecast.

Source: U.S. Department of Commerce, U.S. Industrial Outlook, 1988.

Numbers for metal cans and glass containers show steadily growing markets for the next several years.

FORMULATING FIBER INTO FOODS

"Evidence related to the role of dietary factors in cancer [and gastrointestinal diseases] suggests that foods low or reduced in calories and fat and high in fiber should be made increasingly available by food manufacturers."—C. Everett Koop, M.D., Sc.D., Surgeon General

ANN E. PRZYBYLA
Technical Editor

Dietary recommendations to Americans suggesting increased fiber intake are not new. As early as 1982, the National Academy of Sciences (NAS) made the following recommendation: "Eat whole grain cereal products, fruits and vegetables daily." This was followed by a similar recommendation from the American Institute of Cancer Research in 1983.

By 1984 the recommendations specifically mentioned fiber, when the American Cancer Society said, "Eat more high fiber foods such as fruits, vegetables and whole grain cereals." The same year, the National Cancer Institute (NCI) suggested that Americans consume foods which provide 25 to 35 grams of fiber daily.

Despite these recommendation, though, controversy surrounds the role of fiber in the diet. In 1985, the American Council on Science and Health (ACSH) said that while fiber might protect against colon-rectum cancer because it might reduce exposure of intestinal cells to carcinogens by diluting the intestinal contents and by reducing transit time, that dilution can in fact be due to other factors as well.

A brochure published by ACSH, entitled *Diet and Cancer*, stated: "Unfortunately, as attractive as this hypothesis is, the results of

Cookies	●●●●●
Canned beans	●●●●●
Snack bars	●●●
Cereals	●●●●●●●●●● ●●●●●●●●●
Crackers	●●●●●●●●●● ●●
Bread & rolls	●●●●●●●●●● ●●●●●
Tofu desserts	●●●●
Snacks	●●●●●●●
Frozen entrees	●●●
Dry mix rice dishes	●
Yogurt & fiber	●●●●
Bakery dry mixes	●●●

Source: ProductScan Marketing Intelligence

Fiber is being added to a broad range of foods to help American consume the recommended 35-45 grams of fiber per day.

epidemiologic and laboratory studies are exceptionally equivocal and inconsistent...It has even been reported that under some conditions high levels of dietary fiber can increase colon cancer in rats!"

One also needs to keep in mind that even "conclusive" results from epidemological studies cannot always be interpreted as applying to every individual, explained Dr. Anita Owen, manager of nutrition for Nabisco. She gave the example that while increasing fiber intake will result in the softening and bulking of stools for all individuals, we don't know that increasing fiber intake will reduce the incidence of colon cancer in all individuals.

It is also not certain what role each component of fiber plays in disease prevention. The executive summary of the report of the Committee on Diet, Nutrition, and Cancer of the National Research Council states: "The committee found no conclusive evidence to indicate that dietary fiber (such as that present in certain fruits, vegetables, grains and cereals) exerts a protective effect against colon-rectum cancer in humans. Both epide-

Defining Fiber

Fiber has been referred to as bulk, roughage, bran, plant residue, plantix and unavailable carbohydrates. Botanically, fiber is cell wall material. In the plant it performs a mechanical and structural role, providing rigidity or skeleton. Physiologically, fiber is comprised of the remnants of plant cells which are undigested by human alimentary enzymes. (This definition is attractive because it identifies a measurable item – digestibility.) A pure chemical definition for fiber would describe dietary fiber as a non-starch polysaccharide and lignin.

At one time fiber was measured in terms of crude fiber, or the residue after a food was treated with a solvent, hot acid and hot alkali. But, today we are more interested in total dietary fiber (TDF), or the sum of lignin and polysaccharides that are not digested by gastrointestinal enzymes of the human digestive tract. TDF, therefore, is comprised of cellulose, hemicellulose, pectins, gums, lignin and mucillages.

Cellulose is the most abundant carbohydrate in nature. It is a polymer of glucose, and is the structural material in the cell walls of nearly all land plants. Natural cellulose is insoluble in water and is not digested in the human alimentary canal.

Hemicellulose are plant polysaccharides extractable by aqueous alkali. This definition excludes the water soluble components which some experts consider to be an acid hemicelluloses. Hemicelluloses are branched polymers of pentose and hexose sugars and uronic acids. They create a matrix in which the cellulose fibers are enmeshed.

Pectin substances are a complex mixture of polysaccharides of galacturonic acid units with side chains containing arabinose, galactose, xylose and rhamnose. Pectins are considered to be "water soluble," nonstructured polysaccharides.

Gums and mucillages have no common structure, but are polysaccharides containing several sugars with alternating monomer structures and they may or may not contain uronic acids.

Lignin, polymer of aromatic plant alcohols, the woody substance that gives plants structure and support. As lignin hardens, it acts as the cement to hold the other plant cell wall constituents together. This structural stiffening helps prevent biochemical degradation and physical destruction of the cells and may account for the effectiveness of wheat bran as a fecal bulking agent.

miological and laboratory reports suggest that if there is such an effect, specific components of fiber, rather than total fiber, are more likely to be responsible."

Some studies have indicated that the water-soluble fiber from foods such as oat bran, beans, or certain fruits are associated with lower blood glucose and blood lipid levels. The Surgeon General's report also addresses this point. It states that while frequent consumption of vegetables and fruits, particularly dark green and deep yellow vegetables and cruciferous vegetables (such as cabbage and broccoli), may lower risk for cancers of the lung and bladder as well as some cancers of the alimentary tract, the specific components in these foods that may have protective effects have not yet been established.

"Dietary patterns emphasizing foods high in complex carbohydrates and fiber are associated with lower rates of diverticulosis and some types of cancer. The association shown in epidemiologic and animal studies between diets high in complex carbohydrates and reduced risk for coronary heart disease and diabetes mellitus is, however, difficult to interpret. The fact that such diets tend also to be lower in energy and fats, especially saturated fat and cholesterol, clearly contributes to this difficulty," states the report.

Increasing fiber content of foods

Despite the uncertainty of fiber's exact role in disease prevention, the recommendation from the Surgeon General is clear—Americans should increase their complex carbohydrates and fiber intake.

Nabisco's Owen observed that while, at one time consumers' perceptions of nutrition was concerned with maintaining a desirable weight, it has been redefined so that now the American public is demanding disease prevention from nutrition.

In addition to following the Surgeon General's advice, food manufacturers have an added incentive for increasing fiber content in their products. It has been reported that in 1985 when Kellogg Company put the message on its All Bran cereal that the NCI recommended that Americans eat a diet higher in fiber, bran cereal sales in general rose more than 30 percent.

The percentage (on a poundage basis) of bran cereal purchased as compared to total cereal sales also increased in 1985. SAMI/Burke Inc., a marketing research firm, reports that 14.7 percent of all cereal sold in 1984 was bran cereal. This figure jumped to 16.6 percent in 1985 and to 17.0 percent in 1986. As consumers began to become more

FIBER SOURCES

Type/Brand Name	%Total Dietary Fiber	Characteristics
GRAINS		
Better Basics™ Oat Fibers	93	Fluffy and flour-like, blend taste and no odor.
Oat bran	18-23	Natural oat flavor and odor.
High Fiber Bits (oat)	30-40	May be flavored or colored to enhance taste and eye appeal.
All bran oat flour	68	Bland color.
Dietary Fiber (corn bran)	90 or greater	Fine particle size, mild aroma, bland flavor and light color.
Sunlite™ Corn Bran	80-85	Comes in two granulation sizes (40-10 and 100-20).
Bestbran™ Light (corn)	90	Almost white.
Bestbran™ 90 Toasted (corn)	90	Comes in light toast (cream), medium toast (tan) and dark toast (brown) varieties.
Malted Grain Fiber MGF-200 (barley, malt, rice & cornstarch)	40	Malt taste.
Bran Fiber (amaranth, barley, corn, oats, rye or wheat)	Varies by product	Fibers from hull, bran or whole grain available.
Barley bran/fiber	60-70	Medium or micro grind.
Corn bran/fiber	75-85	Coarse; medium or micro grind.
Oat fiber	85-95	Medium or micro grind. Bland flavor.
Fiber Add No. 1 (wheat, bran oat fiber, corn bran, apple fiber & wheat germ)	60-70	Full flake or micro grind.
Diet fiber corn bran	90	Course, fine and ultra fine grinds. Toasted or non-toasted.
Diet fiber wheat bran	40-45	Golden brown color. Mild or medium granulation.
SOY:		
Fibrim™ soy fiber	75	Bland and odorless
FI-PRO™ F200 soy fiber	55	Light tan color and bland.
FRUIT:		
Tastee Apple Fiber	42.85	Light tan to reddish tan, mild apple flavor.
Apple, black currant and citrus fruit fiber	Varies	White-to-cream color available.
Apple fiber	55-65	Medium or micro grind.

FIBER

Possible Applications	Benefits/Comments	Supplier
Reduced calorie white breads.	High water absorption.	Williamson Fiber Products Louisville, KY **Circle 321**
Hot and cold cereals.	High ratio soluble fiber to total dietary fiber.	National Oats Company Cedar Rapids, IA **Circle 322**
Breads, muffins, soft pretzels.	Retains integrity through normal processing.	Custom Industries, Inc. St. Louis, MO **Circle 323**
Baked products.	—	Niblack Foods Rochester, NY **Circle 324**
Cereals, breads & rolls, pizza, pasta.	Low fat which help eliminate off-flavor caused by rancidity. Absorbs water. Low coloric content.	Corn Products Unit of CPC International, Inc. Summit-Argo, IL **Circle 420**
Cereals, bakery products, snacks.	Low caloric content (less than 1/2 calories per gram).	J.R. Short Milling Company Chicago, IL **Circle 325**
White breads, pasta, cereals.	Low caloric content (1/2 calorie per gram).	A. E. Staley Mfg. Co. Decatur, IL **Circle 326**
Breakfast cereals, snacks, cookies, bakery toppings.	Can replace part of flour in formulation to reduce calories.	A. E. Staley Mfg. Co. Decatur, IL **Circle 326**
Bread and rolls, crackers, extruded products, bran muffins.	Excellent water absorption properties — 2 times dry weight.	Coors Bio Tech, Inc. Westminster, CO **Circle 329**
Bakery products, cereals.	(Manufacturer's note: Hull of grains is not as high in soluble fiber as bran).	Freeman Industries, Inc. Tuckahoe, NY **Circle 329**
Variety of food products.	Calories per gram .80. Crude fiber 22/25%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 330**
Cereals, baked goods, pasta and supplements.	Calories per gram .60. Crude fiber 25%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 330**
Baked goods, diet mixes and supplements.	Calories per gram .30. Crude fiber 30/35%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 330**
As fiber supplement, drinks.	Calories per gram 1.70. Crude fiber 23%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 330**
Cereals, snack foods, variety breads, bakes goods, pasta.	Low in calories.	Lauhoff Grain Company Danvile, IL **Circle 331**
Baked goods, snack foods, variety breads, cereals, pizza crusts.	Low in calories.	Lauhoff Grain Company Danville, IL **Circle 331**
Various types tailored to specific applications.	Primarily cell wall material of soybean — no hull or bran. Has 10% cellulose and 65% hemicellulose and non-cellulosic polysaccharides.	Protein Technologies International St. Louis, MO **Circle 332**
Dairy products, baked goods.	From defatted soy flakes. High water binding capacity (7x). Soluble fiber content 15-19%.	Grain Processing Corp. Muscatine, IA **Circle 333**
extruded products.	High in pectin (19%). Soluble fiber 11.13%.	Tastee Apple Inc. Newcomerstown, OH **Circle 334**
Baked goods.	Citrus products from whole skim and pup or juice sacs.	Freeman Industries, Inc. Tuckahoe, NY **Circle 338**
Baked products.	Calories per gram .90. Crude fiber 36/40%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 339**

familiar with other sources of fiber, however, sales of bran cereals leveled off, explains Alan B. Miller, Jr., of SAMI. In 1986, the percent of cereal purchased that had bran or fiber in its name was 16.5 percent, and for the year ending July 15, 1988 it was 16.8 percent.

The chart on page 78 shows the variety of new products with added fiber introduced in the first seven months of 1988. Cereals only made up 23.3 percent. And new products with added fiber introduced from January to August 8 of 1988–81–already outnumber those introduced in 1987, according to ProductScan, an on-line new product tracking service from Marketing Intelligence Ltd.

These new fiber-added foods are meeting with success in the marketplace. A study was conducted in May, 1987 concerning acceptance of FI-BAR–a high energy bar with 12 sources of dietary fiber. Of 300 respondents, 64 percent expressed positive purchase intent after trying the bar. The manufacturer, Culver City, CA-based Natural Nectar Corp., reported "phenomenal sales" in initial markets in California and the Northeast.

Last July, Wheat n' Bran Triscuit Wafers were introduced nationally by Nabisco Brands, Inc., East Hanover, NJ. In making the introduction, Faye Egan, director of the Nabisco Consumer Food Center said, "Consumers definitely want more bran in their diets, but they also want it in products that taste good and can be used at times other than breakfast. This cracker is being introduced in response to those consumer needs."

Ready-to-eat cereals is estimated to be a $5 billion market. And the competition for fiber-containing ready-to-eat cereals is especially stiff. Last month, Ralston Purina Company expanded distribution of its Bran News Cereal which had been introduced on the west coast in March. According to the manufacturer, the cereal features cereal that stays crunchy in milk and tastes great, two important qualities many consumers say have been lacking in bran cereals.

Numerous products state: "good source of fiber"; "high-fiber"; "fiber-rich"; etc., on the front panel. These include: Post Fruit & Fibre; Post Grape-nuts Flakes; Ralston Bran Chex; and Ralston Wheat Chex.

Even new foods which don't actually claim fiber added but contain ingredients associated with fiber are being readily accepted by consumers. Tree Top, Inc., Selah, WA, reports that the first week Tree Top apple bread was on shelves in eastern Washington and Portland, sales were double what was expected. The bread contains real apple pieces and sunflower seeds.

Type/Brand Name	% Total Dietary Fiber	Characteristics
VEGETABLE:		
Nutrio™ P-Fibre 150 (peas)	50	Coarse, medium and fine grind. Natural color.
Dupro™ fiber concentrates (legumes)	50-90	Crisp or pulpy texture. Natural color or bleached.
Pea fibres	N/A	Neutral, white color. Bland flavor.
Tomato fiber	55-65	Medium or micro grind.
Lupran™ (sweet lupin bean)	83-93	Neutral color and taste.
Barley's Best™ bran flour	70	Uniform course powder.
Hi-Fi Lite (yellow pea hull)	90	Neutral odor and flavor powder.
MISCELLANEOUS:		
Fibrex™ (sugar beet)	81	Fine through coarse sizes available. Bland flavor.
DuoFiber	80	Bland taste, off-white color.
Sugar beet fiber	60-65	Medium or micro grind.
Tofufiber™	55-60	Sl. yellowish gray powder with faint odor and mild, pleasant taste.
GUMS:		
Nutriloid Fiberplus™ (blend of natural gums)	85-95	Free flowing powder, will not affect color of food product.
Gumix natural gums (gum arabic, gum tragacanth, guar gum)	80-90	Bland taste, off-white color.
DYCOL™ 3600 FC guar gum	85-90	Free flowing, moderately coarse powder. Creamy white color.
Gum arabic	80-90	Bland taste, off-white color
Guar gum	85-90	Bland taste, off-white color
Carregeenan	80-90	Bland taste, off-white color
GENU™ carrageenans and pectins	80-90	Pectins: light cream to light tan color. Carrageenan: off-white, bland.
Locust bean gum (and other gums)	80-95	Off-white, bland taste.
Satia™ xanthan gum (and other gums including carrageenan)	80-95	Blend of gums also offered.

FIBER

Possible Applications	Benefits/Comments	Supplier
Supplements, baked products, drinks.	Water binding capacity 12 times its own weight.	Grindsted Products, Inc. Industrial Airport, KS **Circle 340**
Meat systems, bread, rolls, extruded products.	Equal portions soluble to insoluble fiber.	Durpo Div. Dumas Corp. Golden Valley, MN **Circle 341**
Breads, crackers, muffins, snacks, frozen and microwave crust products, pet foods, tomato products.	Good water binding capability.	DDS Nutrio Copenhagen, Denmark **Circle 342**
Processed meats, soups, confections, cookies.	Calories per gram 2.20.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 343**
Tomato-based products.	Selective breeding used to produce Lupin strain with easy-to-digest protein. Contains 40-50% crude fiber.	Intl. Nutrition & Genetics Corp. Minneapolis, MN **Circle 327**
Cereals, pancake mixes.	Has 1.35 calorie per gram and 3% soluble fiber.	National Grain Products Co., Inc. Minnetonka, MN **Circle 360**
Cereals, granola bars, snacks, pasta, nutritional beverages.	Good water holding ability.	Woodstone Foods Minneapolis, MN **Circle 361**
Bread and other bakery products, pasta, cookies, fiber blends.	High water holding capacity. High pectin content — 25%. Has 20-25% soluble fiber.	Delta Fibre Foods Minneapolis, MN **Circle 344**
Cakes, breads, rolls, cookies, cereals, pasta, meat products.	Less than 0.55 calories per gram. At least 10-15% soluble fiber.	American Crystal Sugar Co. Moorhead, MN **Circle 345**
Baked products, cereals, pasta.	Calories per gram .90. High in pectin and soluble gums. Crude fiber 22%.	Canadian Harvest St. Thomas, Ontario, Canada **Circle 345**
Baked goods.	Absorbs 5 times its volume of water. Contains 2-3% soluble fiber.	Tri-K Industries, Inc. Emerson, NJ **Circle 346**
Breads, cookies, cereals, ice cream, drinks, snacks, fiber supplements.	At 1.25% use level in instant drink will result in 3.0 gm added fiber per serving.	TIC Gums Belcamp, MD **Circle 348**
Instant beverages, snacks, baked goods, soups, ice cream, high fiber products (for stabilization).	Provides stabilizing and other functions.	Gumix International, Inc. Hackensack, NJ **Circle 349**
Cereals, beverages, bakery products.	Hydrates to a medium viscosity in aqueous dispersions.	National Starch and Chemical Corp. Bridgewater, NJ **Circle 350**
Hot cereals and high fiber mixes.	Low viscosity.	Colloides Naturels Inc. Bridgewater, NJ **Circle 351**
Drinks, juices.	High viscosity.	Colloides Naturels Inc. Bridgewater, NJ **Circle 351**
Cheese, sauces, gravies.	Has gelling capability.	Colloides Naturels Inc. Bridgewater, NJ **Circle 351**
Puddings, custards.	Pectin extracted from citrus peel.	Hercules, Inc. Middeltown, NY **Circle 353**
Beverages, frozen desserts.	Stabilizer.	Hercules, Inc. Middeltown, NY **Circle 353**
Beverages, desserts, sauces.	Stabilizer, thickening agent.	Sanofi Bio Ingredients, Inc. Germantown, WI **Circle 354**

And product labels are being changed to point out natural sources of fiber such as beans. Campbell Soup Company, Camden, NJ, now includes "Natural High Fiber Source" on its bean products.

The high level of consumer interest in increasing the fiber content of foods can also result in a better image for functional ingredients such as gums. This could be especially beneficial in frozen dairy desserts where gums are used as stabilizers, yet perceived by many consumers as a less than desirable ingredient.

If the public can be educated that gums are a source of fiber rather that thinking them as "additives," there wouldn't be as much resistance to purchasing foods with various gums in the ingredients list, points out Steve Andon, of TIC Gums, Belcamp, MD. The amount of gums used in food formulations is so small, it doesn't contribute significantly to the total fiber content of the foods.

At the same time, fiber is becoming more and more a part of diet food formulation. The success of studies examining fiber's effect on obesity and appetite control is leading to a whole new "fiber" approach to weight control, points out Peter Stewart of Canadian Harvest. "One of the basic ideas of these products is to substitute fiber for other high calorie food ingredients," explains Stewart. "With high fiber foods the fiber's ability to absorb several times it's weight in water causes it to gain volume in the stomach, making the dieter feel fuller."

Formulating with fiber

As food manufacturers increase fiber levels of food products, demand is rising for methods to do so while retaining the palatability of these products. Stewart points out that fibers have been developed with improved water activity (absorption); binding properties – of various sugar and carcinogenic molecules; fat absorption; shelf life or stability; time release characteristics; and compressibility (i.e. the blending of a selection of fibers in a proportion to achieve specific calculated results and benefits such as dietary foods for diabetics that are designed to reduce blood sugar levels and flatten the post prandial response curves).

Delta Fiber Foods offers advice on baking with Fibrex (a fiber made from sugar cane which has 81 percent dietary fiber). The company recommended soaking or scalding Fibrex prior to use and preparation, if it is to be used in soft bread and certain soft cakes, where a dough liquid is used. This allows the Fibrex to absorb liquid; resulting in a stabi-

Type/Brand Name	%Total Dietary Fiber	Characteristics
Unipectine™ pectins	95-100	High and low methoxyl available.
Gelcarin™ carrageenan	80-90	Off-white, bland.
CELLULOSE:		
Solka-Floc™ powdered cellulose	99	White flavorless and inert with eight grades available.
Powdered cellulose grade RC 200 (FCC)	99.5	Highly refined, odorless powder.
Microcrystalline cellulose	99	Fine, white, oderless crystalline powder.
Avicel™ cellulose gel	90-95	Bland taste.
SPECIALTY: *Agglomerated with maltodextrin for easier blending*		
Insta*Fiber™ C (cellulose)	79	Free flowing, dustless.
Insta*Fiber™ S (soy)	36	Free flowing, dustless.
Insta*Fiber™ O (oat)	79.2	Free flowing, dustless.
OTHER: *A number of natural foods contain appreciable amounts of fiber, and, although when used as an ingredient, they may not contribute significantly to the total fiber content, they often offer a perceived benefit to consumers.*		
Figs	16.99	Paste, concentrate, powder, nugget or fresh forms.
Dehydrated tropical fruits	Varies — under 10	Dices, chunks, granulates and other forms offered.
Raspberries (and other fruits)	2-5	Available as stabilized fruit and fruit pieces.
Craisins™ (dried cranberries)	approx. 8	Red color.
Raisins	6.8	Available in a variety of forms including: midget, regular, golden paste and concentrate.
Almonds	approx. 2.6	Available in a variety of forms.
Hazelnuts	3	Domestic grown larger than European grown.
Pecans	2.3	Available in a variety of forms.
Soynut	N/A	Available salted or unsalted in onion, garlic, cajun or barbecue flavors.
Carob Powders	46.6	Imparts sweet, pleasant taste.

FIBER

Possible Applications	Benefits/Comments	Supplier
Milk desserts, creams, salad dressings.	Stabilizer, gelling agent.	Sanofi Bio-ingredients, Inc. Germantown, WI **Circle 354**
Jams, fruit preparations, milk beverages.	Controls ice crystal growth in frozen desserts.	FMC Corp. Marine Colloids Div. Philadelphia, PA **Circle 355**
Frozen desserts, beverages salad dressings.	Is essentially non-caloric.	James River Corp. Hackensack, NJ **Circle 356**
Breads, pastries, cereal, sauces, pasta, canned meats, instant drinks, imitation cheese.	Is essentially non-caloric.	Reed Chemical Corp. Pompton Plains, NJ **Circle 357**
Cereals, pasta, powdered beverages.	Is essentially non-caloric.	Dasco Annadale, NY **Circle 358**
Cereals, pasta, powdered beverages.	Source of insoluble fiber. Also acts as stabilizer.	FMC Corp. Food and Pharmaceutical Products Div. Philadelphia, PA **Circle 352**
Non-fat, flavored milk beverages.	Agglomerated with maltodextrin.	Zumbro, Inc. Hayfield, MN **Circle 359**
Dry mixes (soups, sauces, fortified drinks.)	Agglomerated with maltodextrin.	Zumbro, Inc. Hayfield, MN **Circle 359**
Dry mixes (soups, sauces; (fortified drinks.)	Agglomerated with maltodextrin.	Zumbro, Inc. Hayfield, MN **Circle 359**
Juice, bread, cereal, cookies, sauces, fruit mixes, confections.	Among highest fiber ratio of any fruits used in food formulations.	California Fig Advisory Board Fresno, CA **Circle 335**
Cereals, baked products, snacks, confections.	Guava, mango, pineapple, coconut, banana, etc.	Gourmet Club Oakland, NJ **Circle 336**
Ice cream, yogurt, baked goods.	—	Kraus & Co. Inc. Oak Park, MI **Circle 362**
Baked products, cereal, cookies.	—	Ocean Spray Cranberries, Inc. Plymouth, MA **Circle 363**
Cereals, confections, cookies, fillings, yogurt.	Crude fiber 1.3%.	California Raisin Advisory Board San Francisco, CA **Circle 364**
Cereals, confections, cookies, snack mixes.	—	California Almond Growers Exchange Sacramento, CA **Circle 365**
Cereals, baked goods.	Used in Kellogg's Mueslix Five Grain Cereal.	Hazelnut Marketing Board Tigard, OR **Circle 366**
Cereals, baked goods.	—	Tracy-Luckey Harlem, GA **Circle 367**
Mixes, granola, natural cookies.	Soynut butter has 3.9% dietary fiber.	Inari Ltd. Mason, MI **Circle 368**
Sweet baked goods, syrups, ice cream, drinks.	Can replace 25-50% cocoa powders in bakery, dairy and confectionery products.	Spring Tree Corporation Brattleboro, VT **Circle 347**

lized mix. If Fibrex is added to the flour mix, the quantity of liquid given in the formula should be increased.

When Fibrex is used to replace approximately 10 percent of the dough weight the formula needs to be adjusted. The can be done by: replacing a part of the flour with Fibrex; replacing a part of the coarse flour with wheat flour; increasing the yeast content; and adding more dough liquid.

When a homogenious and very compact end product is desired, a finely ground fraction of Fibrex (600) should be used. The nonground fraction (Fibrex 620) should be chosen if a more porous end product is required. The different fractions can also be blended.

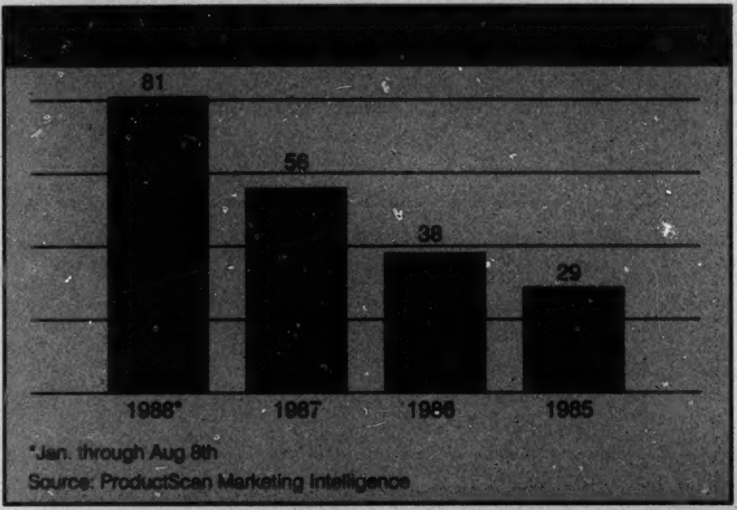
It is important to remember that Fibrex does not have the ability to bind a dough together; it only binds together with water.

Bright future for fiber

The average North American consumes 10-15 grams of fiber per day, while the recommendations for fiber consumption are 35-40 grams (another ounce) per day. The potential that this creates is described by Canadian Harvest's Stewart. "One ounce times 365 days times 300 million people in North America translates to 6.8 billion pounds per year in new fiber demand," says Stewart.

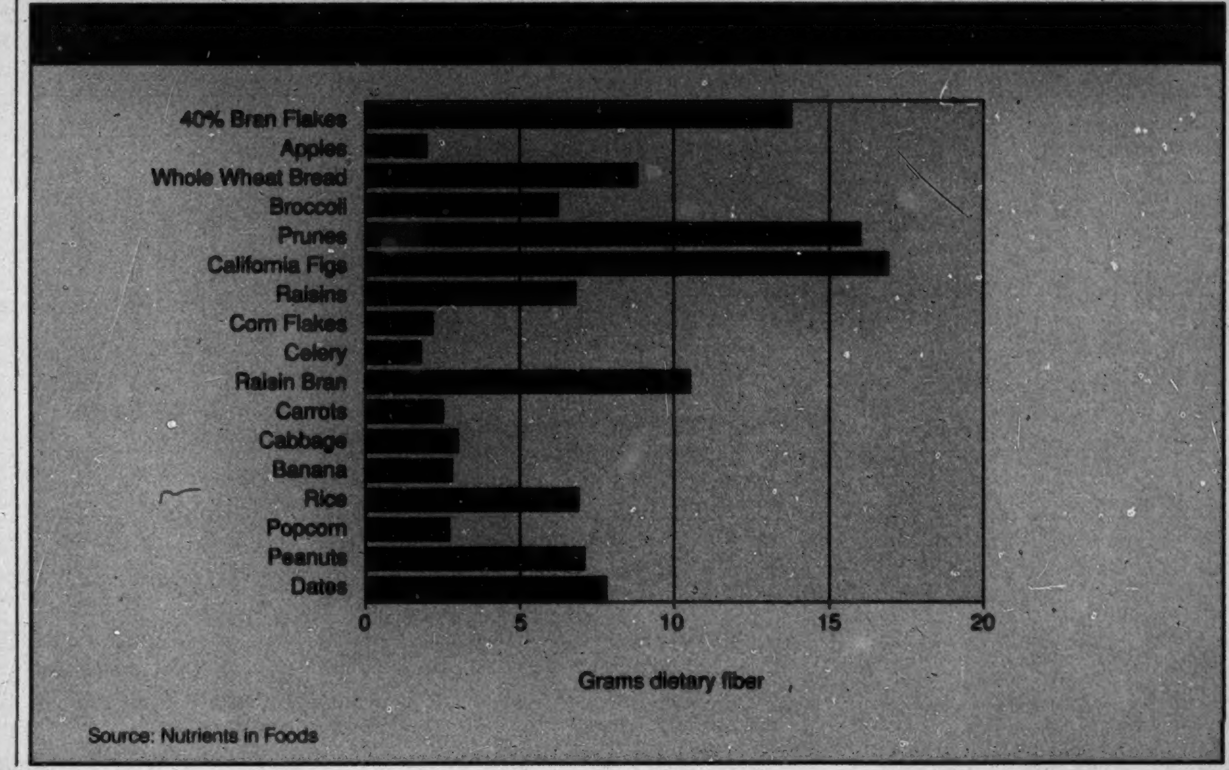
But while fiber will be a growing market, a new study entitled, *Dietary Fiber Supplements in North America: Challenges and Opportunities for an Emerging Industry*, by HRA, Inc., Prairie Village, KS, points out that there are going to be niches. "The real key to success for a fiber producer is knowing where the niches are that meet both his product and service strengths," says J.M. (Matt) Hesser, director of HRA. He points out that some of the early traditional grain sources of fiber are being challenged. The individual application is the key and the result is that there is no one ideal source.

Top: Food processors are capitalizing on consumers' concern over obtaining an adequate fiber intake by expanding the number of new foods containing fiber. Bottom: A comparison of dietary fiber in a variety of foods is shown.



*Jan. through Aug 8th

Source: ProductScan Marketing Intelligence



Source: Nutrients in Foods

PACKAGING BUYERS SURVEY

FOOD ENGINEERING'S
EXECUTIVE
ADVISORY
PANEL

As packaging technologies expand, so do the desires of the users of those technologies. And the challenge for better technology has been issued to suppliers of packaging material and equipment.

LINDA K. FREEMAN
Contributing Editor

Once again the gauntlet has been dropped, and the challenge issued to the suppliers of packaging materials and equipment.

In responding to the questions in *Food Engineering's* annual Packaging Buyers Survey, the members of the magazine's exclusive Executive Advisory Panel are letting the packaging companies know, "You've done well...but there's a lot more to be done." The solutions to yesterday's problems provide the basis for today's technological advances; but the challenge is never-ending.

Machinery purchases

Respondents were asked to check the types of packaging machinery their operation had purchased in the past twelve months.

	Total	Meat products	Bakery products	Dairy products	Flavors/ food ingreds.	Canned fruit/veg/ entrees	Fats and oils	Frozen fruit/veg/ entrees	Confectionery products	Cereal/ grain products	Beverages
Aseptic packaging equipment	18.2%	23.5%	24.6%	31.6%	20.0%	33.9%	22.2%	27.8%	22.7%	22.8%	32.8%
Bag-in-box	23.9	20.6	33.3	34.2	26.2	32.2	24.4	30.6	34.1	38.6	35.9
Blow molding equipment (incl. blow mold/fill/seal)	5.3	5.9	5.3	5.1	3.1	8.5	6.7	8.3	4.5	8.8	4.7
Cartoners	42.5	54.4	54.4	53.2	43.1	49.2	46.7	61.1	59.1	64.9	43.8
Casers	42.9	44.1	43.9	55.7	36.9	49.2	46.7	41.7	38.6	59.6	45.3
Closure handling, application	23.1	26.5	26.3	22.8	26.2	23.7	24.4	25.0	25.0	31.6	28.1
Filling equipment (liquids)	38.5	32.4	38.6	48.1	40.0	49.2	48.9	58.3	40.9	42.1	46.9
Filling equipment (dry products)	28.7	27.9	29.8	31.6	38.5	32.2	31.1	38.9	36.4	49.1	29.7
Filling controls	30.4	30.9	28.1	30.4	44.6	42.4	40.0	41.7	27.3	43.9	37.5
Gas flush systems	21.1	33.8	15.8	25.3	21.5	18.6	20.0	25.0	22.7	15.8	18.8
Vertical form/fill/seal	17.8	20.6	22.8	16.5	18.5	16.9	17.8	19.4	27.3	40.4	14.1
Horizontal form/fill/seal	19.8	29.4	26.3	25.3	21.5	25.4	22.2	33.3	22.7	28.1	20.3
Inspection/detection devices	31.6	45.6	28.1	31.6	33.8	40.7	40.0	44.4	22.7	40.4	40.6
Labelers	47.0	50.0	57.9	55.7	49.2	50.8	57.8	50.0	50.0	49.1	48.4
Markers, coders, imprinters	52.6	55.9	50.9	55.7	50.8	61.0	60.0	58.3	52.3	49.1	57.8
Shrink wrappers (non-palletizing)	23.5	22.1	36.8	25.3	24.6	25.4	17.8	25.0	27.3	26.3	31.3
Shrink wrappers (palletizing)	15.8	13.2	8.8	15.2	18.5	20.3	11.1	16.7	15.9	22.8	17.2
Stretch wrappers (non-palletizing)	15.4	14.7	10.5	12.7	13.8	16.9	13.3	16.7	9.1	22.8	7.8
Stretch wrappers (palletizing)	18.6	16.2	10.5	20.3	15.4	18.6	20.0	22.2	11.4	22.8	18.8
Thermoform/fill/seal	7.7	10.3	7.0	7.6	6.2	15.3	8.9	11.1	6.8	10.5	10.9
Tray formers	10.1	13.2	12.3	6.3	9.2	13.6	4.4	22.2	2.3	8.8	14.1
Weighers	38.5	42.6	47.4	36.7	49.2	35.6	40.0	58.3	40.9	50.9	39.1

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Important packaging areas

Respondents were asked to check the areas of food packaging likely to be of most importance to their firms over the next two years.

	Percent
Aseptic packaging of high-acid products	24.7
Aseptic packaging of low-acid products, including particulate foods	33.7
Dual-ovenable packaging	30.3
Controlled/modified atmosphere packaging (other than vacuum)	37.8
Vacuum packaging	29.6
Packaging with barrier plastics	59.2
High barrier films	41.2
Tamper-evident packaging	18.4
Thermoforming	20.2
Extended shelf life packaging for refrigerated products	34.8
Retortable plastic packages	20.6
Metal containers	20.6
Plastic cans	24.7
Glass packaging	25.8
Improved lidding/adhesives	27.3

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Concerns about CAP/MAP

Respondents were asked which statement expresses their greatest concern about CAP/MAP.

	Percent
Higher cost of packaging materials and machinery	33.0
Ability of distribution to maintain proper refrigerated temperature	34.8
Ability of films to protect food under modified atmosphere	27.5
Questions about machinery design, reliability, or size changeover	27.2
Ability of lidding materials to contain modified atmosphere/ provide ease of opening	19.6
Identifying optimal gas mixture for preserving product/maintaining it	34.8

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Building barriers

An example is barrier plastics. For the third year in a row more than 59 percent of the respondents checked barrier plastics as being of great importance to them over the next two years. And indeed, barrier plastics have come a long way in recent years, as technology has yielded better plastics with barrier layers and made them more available at a lower price.

The food industry, however, is demanding more. One respondent is looking for "high barrier plastics for extended (3 year) shelf life." Another needs "inexpensive, high temperature, high barrier plastic, heat sealable containers." The list goes on to include hot fillable, clear, unbreakable high barrier plastic bottles...at a reasonable price. Each year the list of requirements for barrier packages continues to grow: there must be oxygen barrier; flavor barrier; moisture barrier; light and UV barrier; mechanical properties; thermal properties; and aesthetics.

"High Barrier Films," listed as being of significant importance by more than 47 percent of the respondents, are needed to fill a variety of needs. One respondent was very specific, saying he needs "a formable film that has an outer oxygen barrier that peels off easily and leaves an inner film with oxygen transmission properties but maintains a water vapor barrier. On packaging it should look like a vacuum skin pack, afterwards in a grocery case, a bloomed piece of meat."

Said another respondent: "We need a method to package precooked meats to assure a 90 day refrigerated shelf life without having to reheat inside the final pouch/container for microbial kill. Need a nice appearing package since it will go retail and customer wants good image presentation. Need is for equipment film to do this."

Tamper-evident packaging

More than 60 percent of the survey's respondents checked off tamper-evident packaging as being of major importance. In the past several years, the use of tamper-evident packaging has increased substantially, both in response to processor concerns and in answer to consumer demands.

One processor is looking for a tamper-evident lid for dairy cups. He says: "This seems to be taking a back seat to other tamper-evident containers and advancements. The dairy industry has been pushed off into a corner with tamper-evident bands as the only alternative. Tamper evident banding machines and material are costly, inefficient and not very well designed for high speed filling."

CAP/MAP

No current discussion of packaging could take place without talking about controlled/modified atmosphere packaging, an area of interest to 37.8 percent of the survey respondents. Many of those polled expressed their concerns about CAP/MAP (see chart) and many were very specific in describing their needs:

- A barrier package for CAP wherein a contained system produces an exothermic chemical reaction in response to elevated

Inspection equipment in use

Respondents were asked what type of package inspection equipment they currently have.

	Percent
Vision (black/white)	13.8
Vision (color)	6.9
Infra-red	4.3
Gamma ray	7.2
X-ray	5.4
Sonic	10.5
Vacuum	19.2
Mechanical seam	9.8
Other	12.0

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Inspection capabilities

Respondents were asked what their inspection equipment could inspect.

	Percent
Cracks & chips	9.8
Solid contamination	8.0
Liquid contamination	3.3
Sidewall/bottom thickness	5.4
Label position	14.5
Label integrity (tears, etc.)	7.6
Distorted label characters	4.0
Fill height	17.0
Seam/vacuum integrity	24.3
Seal integrity (adhesives)	12.7
Cap tilt	9.4
Other	6.2

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Plant-site manufacturing

Respondents were asked to indicate the type of manufacturing done, if their plants do package manufacturing at the plant site.

	Percent
Can manufacturing	29.8
Thermoform from plastic sheet	27.3
Blow molding	16.5
Paperboard blank assembly (primary package)	37.2
Other	13.2

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

temperature. The chilling effect would respond to temperature abuse of refrigerated products, and would cease when refrigeration is reattained or when the package is opened.

- The use of CAP/MAP must take into account dissolved oxygen in particulate, hard-to-fill foods where air incorporation is difficult, or almost impossible in some cases, to control. This, said the respondent, needs more than a "flush" type system.
- Resealable CAP packaging with the ability to reintroduce the atmosphere into the container once it is opened and a portion of the product is removed. This would eliminate the need for individual packing of portions.
- One respondent had what he called his "total blue sky idea." He wants a gas flush package (see through) where the inside environment (gas) turns color when microbiological spoilage occurs.

Spoilage, in fact, has always been a prime concern for processors, now even more so with the growth of fresh, refrigerated foods. The two highest levels of concern with CAP/MAP were distribution's ability to maintain proper refrigerated temperature during shipping and handling (34.8 percent) and being able to identify the optimal gas mixture for preserving and maintaining individual products (34.8 percent).

Fresh, refrigerated market

Looking at the results of the survey, one area that shows considerable potential growth is in the use of time/temperature package monitors for use in supplying shelf life information for fresh, refrigerated foods. A significant 45.2 percent of the respondents indicated they were considering use of time/temperature monitors. When compared against the 4.8 percent who said they are already using the monitors, this reflects intense interest in these devices and a huge area of potential growth within the packaging industry.

And whether they seek longer shelf life packaging for fresh poultry with better barrier characteristics or they want to use an oxygen absorber that enhances extended shelf life, what processors seek is the right package to meet their needs in the competitive arena of the refrigerated supermarket cases.

Such spectacular growth has taken place in this arena that the fight is clearly on for dominance. To get that, you've got to have the right package regardless of how "right" the product may be.

Lids, lidstock, and adhesives

We opened Pandora's box with our question about problems with lidstock and/or ad-

Use of heat-sensitive inks

Respondents were asked if they retort products, were they considering using heat-sensitive inks on each package to identify whether the package has been exposed to the proper thermal conditions.

	Total
Already using	20.6%
Already using, but only on retort basket tags	4.9
Considering use	28.4
Not considering use	46.1

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Refrigerated time/temperature monitor use

Respondents were asked if they produce fresh foods where shelf life information is important, are they considering using the new generation of time/temperature package monitors in their distribution.

	Total
Already using	4.8%
Considering use	45.2
Not considering use	49.2

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Susceptors

Respondents were asked if they currently produce microwaveable foods in trays, are they exploring any of the susceptor and other metal technologies to enhance microwave package performance.

Yes	60.5%
No	39.5%

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

Susceptor use — why not?

Respondents were asked why they were not exploring any susceptor or other metal technologies for microwave packages.

	Percent
Too expensive	9.1
Too complicated	6.8
Corporate intertia	13.6
No real advantage for our particular products	68.2

Note: Total of numbers shown may be more/less than 100% due to multiple answers or no response.

Source: Food Engineering Executive Advisory Panel

hesives, and received an onslaught of responses.

What is it the processors are looking for? Seal integrity, *with* peelability, for one, (a high-security/easy-open system that would stand up to the distribution system, yet that the consumer could easily open); a peel seal that withstands high stress during fabrication; compatibility between lidstock and cupstock; microwaveable, peelable, see-through lidstock for plastic retort containers; lidding materials that maintain their seal integrity until the product is microwaved, then the seal releases giving the consumer easy access.

Yes, all of these things sound reasonable...it's just a matter of accomplishing them.

High investment in equipment

According to the survey, the industry was certainly not hesitant about investing in equipment. Markers/coders/imprinters, cartoners, tray formers, weighers, labelers and casers were among the most-purchased pieces of equipment in the last year (see chart for individual breakdown).

Here, too, however, there is a wide range of needs which processors are having difficulty filling, including everything from an aseptic system that works well with fruit particulates (current units, say the respondent, are destructive) to a high-speed filling and sealing system with a leak detection system for packaging retortable plastic containers with lids. Another processor wants packaging equipment that is self-adjusting in relation to material being used, and that offers self-corrective timing with the machine itself.

One processor's demand was pretty easy to understand: "[I want] one piece of equipment that doesn't exceed the cost of my house!"

Heightened activity in the offing

A review of the charts accompanying this feature will give each reader an idea of where there was activity, concern, advances, etc. during the past year. What it also points out is that it was another year of heightened activity is an area of the industry that is becoming ever-more complex.

Almost every respondent had a "wish" he wanted fulfilled. Now it is up to the packaging industry to develop the new technologies and extensions of existing technologies to meet the needs of this rapidly changing marketplace.